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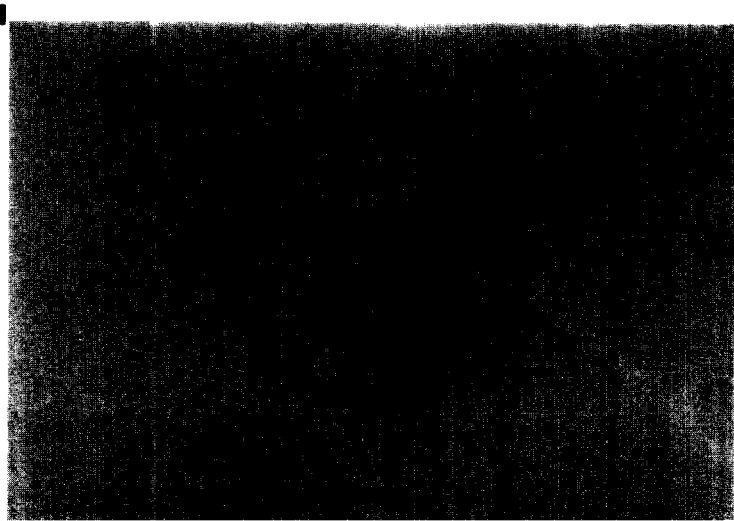
Public Health Assessment for

ENVIRO-CHEM CORPORATION

ZIONSVILLE, BOONE COUNTY, INDIANA

CERCLIS NO. IND084259951

SEPTEMBER 30, 1994



THE ATSDR HEALTH ASSESSMENT: A NOTE OF EXPLANATION

Section 104 (i) (6) (F) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, states "...the term 'health assessment' shall include preliminary assessments of potential risks to human health posed by individual sites and facilities, based on such factors as the nature and extent of contamination, the existence of potential pathways of human exposure (including ground or surface water contamination, air emissions, and food chain contamination), the size and potential susceptibility of the community within the likely pathways of exposure, the comparison of expected human exposure levels to the short-term and long-term health effects associated with identified hazardous substances and any available recommended exposure or tolerance limits for such hazardous substances, and the comparison of existing morbidity and mortality data on diseases that may be associated with the observed levels of exposure. The Administrator of ATSDR shall use appropriate data, risks assessments, risk evaluations and studies available from the Administrator of EPA."

In accordance with the CERCLA section cited, this Health Assessment has been conducted using available data. Additional Health Assessments may be conducted for this site as more information becomes available.

The conclusions and recommendations presented in this Health Assessment are the result of site specific analyses and are not to be cited or quoted for other evaluations or Health Assessments.

PUBLIC HEALTH ASSESSMENT

ENVIRO-CHEM CORPORATION

ZIONSVILLE, BOONE COUNTY, INDIANA

CERCLIS NO. IND084259951

Prepared by

Indiana State Department of Health
Under Cooperative Agreement With The
Agency for Toxic Substances and Disease Registry

PREFACE

This public health assessment was made available for public comment from June 21, 1993 to July 21, 1993. No new environmental data were incorporated into this document after the July 1993 closing of the public comment period. All public comments have been addressed and incorporated into this final June 1994 document.

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

This Public Health Assessment was prepared by ATSDR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) section 104 (i)(6) (42 U.S.C. 9604 (i)(6), and in accordance with our implementing regulations 42 C.F.R. Part 90). In preparing this document ATSDR has collected relevant health data, environmental data, and community health concerns from the Environmental Protection Agency (EPA), state and local health and environmental agencies, the community, and potentially responsible parties, where appropriate.

In addition, this document has previously been provided to EPA and the affected states in an initial release, as required by CERCLA section 104 (i)(6)(H) for their information and review. The revised document was released for a 30 day public comment period. Subsequent to the public comment period, ATSDR addressed all public comments and revised or appended the document as appropriate. The public health assessment has now been reissued. This concludes the public health assessment process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

Additional copies of this report are available from:
National Technical Information Service, Springfield, Virginia
(703) 487-4650

FOREWORD

The Agency for Toxic Substances and Disease Registry, ATSDR, is an agency of the U.S. Public Health Service. It was established by Congress in 1980 under the Comprehensive Environmental Response, Compensation, and Liability Act, also known as the *Superfund* law. This law set up a fund to identify and clean up our country's hazardous waste sites. The Environmental Protection Agency, EPA, and the individual states regulate the investigation and clean up of the sites.

Since 1986, ATSDR has been required by law to conduct a public health assessment at each of the sites on the EPA National Priorities List. The aim of these evaluations is to find out if people are being exposed to hazardous substances and, if so, whether that exposure is harmful and should be stopped or reduced. (The legal definition of a health assessment is included on the inside front cover.) If appropriate, ATSDR also conducts public health assessments when petitioned by concerned individuals. Public health assessments are carried out by environmental and health scientists from ATSDR and from the states with which ATSDR has cooperative agreements.

Exposure: As the first step in the evaluation, ATSDR scientists review environmental data to see how much contamination is at a site, where it is, and how people might come into contact with it. Generally, ATSDR does not collect its own environmental sampling data but reviews information provided by EPA, other government agencies, businesses, and the public. When there is not enough environmental information available, the report will indicate what further sampling data is needed.

Health Effects: If the review of the environmental data shows that people have or could come into contact with hazardous substances, ATSDR scientists then evaluate whether or not there will be any harmful effects from these exposures. The report focuses on public health, or the health impact on the community as a whole, rather than on individual risks. Again, ATSDR generally makes use of existing scientific information, which can include the results of medical, toxicologic and epidemiologic studies and the data collected in disease registries. The science of environmental health is still developing, and sometimes scientific information on the health effects of certain substances is not available. When this is so, the report will suggest what further research studies are needed.

Conclusions: The report presents conclusions about the level of health threat, if any, posed by a site and recommends ways to stop or reduce exposure in its public health action plan. ATSDR is primarily an advisory agency, so usually these reports identify what actions are appropriate to be undertaken by EPA, other responsible parties, or the research or education divisions

of ATSDR. However, if there is an urgent health threat, ATSDR can issue a public health advisory warning people of the danger. ATSDR can also authorize health education or pilot studies of health effects, full-scale epidemiology studies, disease registries, surveillance studies or research on specific hazardous substances.

Interactive Process: The health assessment is an interactive process. ATSDR solicits and evaluates information from numerous city, state and federal agencies, the companies responsible for cleaning up the site, and the community. It then shares its conclusions with them. Agencies are asked to respond to an early version of the report to make sure that the data they have provided is accurate and current. When informed of ATSDR's conclusions and recommendations, sometimes the agencies will begin to act on them before the final release of the report.

Community: ATSDR also needs to learn what people in the area know about the site and what concerns they may have about its impact on their health. Consequently, throughout the evaluation process, ATSDR actively gathers information and comments from the people who live or work near a site, including residents of the area, civic leaders, health professionals and community groups. To ensure that the report responds to the community's health concerns, an early version is also distributed to the public for their comments. All the comments received from the public are responded to in the final version of the report.

Comments: If, after reading this report, you have questions or comments, we encourage you to send them to us.

Letters should be addressed as follows:

Attention: Chief, Program Evaluation, Records and Information Services Branch, Agency for Toxic Substances and Disease Registry, 1600 Clifton Road (E-56), Atlanta, GA 30333.

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SUMMARY

The Envirochem Corporation (ECC) site is in Boone County, Indiana, about 5 miles north of Zionsville and 10 miles northwest of Indianapolis. This site borders the Northside Sanitary Landfill, another Superfund site.

Evidence exists that the site poses a public health hazard due to exposures which have occurred in the past, are presently occurring, or are likely to occur in the future. The estimated exposures are to sodium, and potentially to chlorinated volatile organic compounds and inorganic substances found in the on-site groundwater, which could migrate to the private wells. These chemicals were found at concentrations in the residential wells that, upon long-term exposures (greater than 1 year), can cause adverse health effects to any segment of the receptor population.

Potential exposure pathways exist for individuals involved in recreational activities in Finley Creek, and to individuals eating aquatic life caught in Finley Creek. Because Envirochem Corporation and Northside Sanitary Landfill are so close together, it is difficult to discern the actual source of contaminants. Remedial workers and plant employees are at risk of adverse health effects if safety and health guidelines are not followed.

The community raised several non-health related questions about the remediation of the site. Health related questions primarily concerned the depth and types of contaminants found on-site.

The Indiana State Department of Health has made the following recommendations: 1) provide frequent monitoring of residential wells for contaminant migration in groundwater; 2) provide off-site groundwater monitoring designed to ensure that no contamination reaches the residential wells; 3) provide drinking water to households with sodium contaminated private wells; 4) inform residents with private wells of the possible health effects caused by the drinking of water containing high levels of sodium; 5) implement institutional controls in the near future to prevent the use of the contaminated aquifer for drinking water supplies; 6) inform area residents of the potential danger of eating aquatic species taken from Finley Creek; 7) implement actions for monitoring or other removal and/or remedial actions needed to ensure that humans are not exposed to significant concentrations of site-related chemicals in the off-site surface water; 8) protect persons on and off the site from exposure to dusts or vapors that may be released during remediation; 9) characterize off-site surface soil; and 10) provide remedial workers with adequate protective equipment and training in accordance with 29 CFR 1910.120.

BACKGROUND

A. Site Description and History

The Envirochem Corporation (ECC) site is in Boone County, Indiana, about 5 miles north of Zionsville and 10 miles northwest of Indianapolis (Figure 1, Appendix A). Farm land borders the southern edge of the site, and the Northside Sanitary Landfill (NSL) borders the eastern edge of the site. NSL is also a Superfund site, but separate, and will not be addressed in this public health assessment except when referrals are made because of its close proximity to the ECC site. Residential properties are to the north and west.

The 6 ½-acre site is an inactive facility that processed and reclaimed solvents from August 1977 until May 1982 when the state closed the site. Wastes such as resins, paint sludges, waste oils, and flammable solvents were received in drums and bulk tankers and were stored on-site in drums and storage tanks. On-site accumulation and unauthorized discharge of contaminated storage water, poor management of drum inventory, unapproved burning of chlorinated hydrocarbons and other solvents, and several spills (area of contamination not known) brought the state and the U.S. Environmental Protection Agency (EPA) to investigate the site. The state prohibited the further shipment of waste to the site; however, over 26,000 drums and 400,000 gallons of waste remained on-site. In addition, contaminated underground and aboveground storage tanks, and wastewater in holding ponds were present.

The site was placed on the National Priorities List (NPL) in September 1983. A Consent Decree was negotiated in September 1983 between the EPA, the state of Indiana, and 246 potentially responsible parties (PRPs), which included the establishment of a fund to finance the removal work that the EPA began. The parties also agreed to perform the surface cleanup work at the site.

Between March 1983 and August 1984, the EPA and a group of PRPs responsible for site contamination performed immediate actions that included removing and treating waste from on-site storage tanks, and removing and treating 5,650 cubic yards of contaminated soils. Actions were also taken to prevent contaminated water from overflowing into off-site surface waters. In July 1983, bulk tanks and treated water from cooling ponds were removed in addition to 3,085 drums and 167,000 gallons of liquid waste.

Between August and October 1984, further surface cleanup work took place. A holding pond was drained and capped, and the pond water was transported off-site to an approved facility for treatment.

The contents of the on-site tanks were sampled and tested for compatibility. Compatible tank contents were combined and the tanks were then dried and cleaned. Sludge from the tanks was placed into drums for removal and treatment off-site. Other underground tanks and pipes were located and recovered. The tanks containing PCBs were cleaned and rinsed. The

entire site was then capped and seeded, and drainages were set up to control surface water runoff.

In March 1985, contaminated water was discovered ponded on the concrete cap at the southern end of ECC. It was determined that this water was runoff and not groundwater rising up through the concrete pad. During the resulting emergency action, a sump was constructed by EPA at the southeast corner of the site. A total of 20,000 gallons of contaminated water containing high levels of VOCs were removed and disposed.

EPA conducted a Remedial Investigation/Feasibility Study (RI/FS) between 1983 and 1986. A preliminary health assessment was performed by the Agency for Toxic Substances and Disease Registry (ATSDR) in March of 1987. It was concluded that as a result of previous remedial actions at the site, the major sources of contamination had been removed; however, there appeared to be individual areas of the site which would warrant further investigation to determine their potential for further contamination. Recommendations were to perform further environmental monitoring to adequately assess the present condition of the site, surface water quality, and domestic water supply wells; and to only consider the implementation of those remedial alternatives which reduce the potential for exposure and thereby protect public health.

EPA also completed an analysis of combined alternatives which evaluated comprehensive solutions for the ECC site and the adjacent NSL site. Due to the proximity of the sites, the combined analysis was performed to avoid duplication of effort, and to ensure that all remedial actions would be compatible and cost effective. (EPA Remedial Investigation/Feasibility Study)

Nine combined cleanup alternatives were considered for the two adjacent Superfund sites. The selected alternative, which consists of an on-site leachate and groundwater collection and treatment system, multi-layer cap, and access restrictions was documented in the original Record of Decision (ROD) signed in September 1987. Once the original ROD was signed, EPA began negotiating a settlement with the PRPs for the cleanup of both sites (EPA Record of Decision). A group of PRPs for the ECC site, known as the "settling defendants", accepted responsibility for cleanup of that site. The settling defendants, however, proposed using an enhanced soil vapor extraction (SVE) system rather than the groundwater collection and treatment system prescribed in the original ROD. The EPA expressed interest, but was concerned about the SVE system's technical feasibility and performance. The settling defendants conducted a pilot SVE test at the site in June 1988. The results indicated that a vapor extraction process could significantly reduce the level of volatile organic compounds (VOCs) in the soil. Eventually, the settling defendants offered to remediate the ECC site using an enhanced SVE system that would also treat the extracted vapor. EPA and the Indiana Department of Environmental Management (IDEM) analyzed that offer and the information developed on the SVE, which led to the proposed ROD amendments signed in June 1991 (EPA Record of Decision Amendments).

A primary reason for the proposed ROD amendment for the ECC site is to facilitate implementation of separate remedies for the ECC and NSL sites, and to modify the selected remedy for the ECC site. The major differences between the original remedy for the ECC site and the remedy proposed in the ROD amendment are:

- the use of an enhanced SVE system to remove and destroy on-site VOCs rather than a groundwater collection and on-site treatment system;
- the addition of on-site health-based cleanup levels for soil and groundwater (these were not applicable to the original ROD); and
- the use of a subsurface water collection system in the event the SVE system does not reduce on-site contamination to applicable levels within five years.

Key portions of the ECC site 1987 cleanup remedy that will remain the same are:

- access restrictions implemented to control use of the site;
- a multi-layer cap designed to prevent direct contact with contaminated soil and to reduce water infiltration;
- off-site cleanup standards for surface water and groundwater, except that an additional cleanup standard will be added for PCBs; and
- off-site subsurface and surface water monitoring designed to ensure that no contamination reaches the unnamed ditch and Finley Creek.

A Consent Decree between EPA, the state of Indiana, and the ECC settling defendants was entered in court in September 1991. After the Consent Decree and the ROD amendment have been finalized, the remedial design (RD) and remedial action (RA) phases will begin. (Consent Decree)

During the RD/RA phases, technical drawings and specifications will be developed for the selected remedy and, after EPA approval, the remedial action will be implemented. The settling defendants have submitted all RD construction drawings and specifications to EPA for approval.

B. Site Visit

On June 12, 1992, Ms. Dollis Wright and Mr. Garry Mills of the Indiana State Department of Health (ISDH), and staff from IDEM and NSL (property owner) visited the site. During the site visit, we observed the following:

1. The front gate to the fence surrounding the site was open. The site is accessible; however, only through the front entrance where the main office is located, and where all visitors are required to stop.

2. There are two open structures (former office and process building) that are to be razed during remediation of the site.

3. There were many storage tanks on-site (50-52 estimated). Some were empty (due to a removal action conducted in 1983), and some still contained tank bottom residues as explained by IDEM and NSL staff.

4. There were three separate areas on-site that contained drums. One area was a concrete pad area for decontamination from past remediation activities. The drums (6 total) contain purged well water, soil boring material, and safety suits. The drums in the other two drum areas were either empty or their contents are unknown (100 total).

5. The ECC site is well vegetated throughout.

6. There was debris on-site including building materials and lumber.

7. We observed the location where a pilot SVE study (in the proposed ROD amendment) was previously conducted in 1988-89 to determine whether vapors could be extracted from the soil.

8. West of the site is a container facility which is a recycling operation owned by the NSL owner.

9. The unnamed ditch water level was low during the site visit. We were told that the ditch is usually dry and that it is an intermittent stream (not permanent) which separates the ECC and NSL sites.

10. We observed several monitoring well locations at the ECC site. Presently, there is only one well on-site. Additional monitoring wells have been installed off-site that were not a part of the final RI report released in March 1986.

On September 8, 1994, another site visit was conducted at the Enviro-Chem Corporation Superfund site by Ms. Dollis Wright and Mr. Garry Mills of the ISDH. Also present were staff from the Indiana Department of Environmental Management.

The following are observations made during the site visit, and actions taken at the site as of September 8, 1994:

1. The entire site is enclosed by a chain-link fence, but is accessible in some areas due to fencing not extending vertically all the way to ground level. Warning signs are posted.

2. All on-site buildings and above-ground tanks have been dismantled and removed from the property.

3. A support zone has been established which has a drainage ditch constructed around it to prevent surface run-off from the designated exclusion zone (contaminated area). The support zone has concrete underneath with gravel on top.

4. There is possibly contaminants in the support zone, which is undergoing an investigation by IDEM staff, potentially resulting in a change of the Remedial Investigation.

5. The exclusion zone includes a drum staging area on a concrete pad that has in excess of 170 drums. The drums are to be categorized (type of waste) and removed from the site this fall (1994) per IDEM staff.

6. There is a decontamination storage pad area which has a sump pump pad next to it. There is standing rain water at both locations.

7. The site has been graded and has vegetation growing on it. Gravel has been placed on all exposed land.

8. Monitoring wells are on-site, but no monitoring is being conducted.

9. Activities were observed at the Boone County Resource & Recovery System, Inc. recycling operation, which is adjacent (west) to Enviro-Chem.

C. Demographics, Land Use, and Natural Resource Use

Demographics

The 1990 Census showed the population of Boone County to be 38,147, and the population of Zionsville, which is 5 miles south of the site (nearest town to the site), to be 5,281. Union Township has a population of 1,707 with 569 households. It has a total of 889 males and 818 females. The origin of race in Union Township is represented by the following: white (1,687); black (10); American Indian, Eskimo, or Aleut (5); Asian or Pacific Islander (5); and other race (0).

A small residential community, Northfield, is ¼ mile north/northwest of the site. The nearest residence is 600 feet from the site. Approximately 50 residences are within 1 mile of the site. The Northfield Community Church, along with several residences owned by the NSL private owner's family, border the site. The site is closed for business and inaccessible to the public; therefore, remedial workers are the only population that currently go on-site.

Land Use

The site is in a rural area and is bounded on the south and east by farm land. The majority of the residences in the vicinity are north and west of the site. Farming, mainly cash grain and livestock, is the main enterprise in the county. Corn, soybeans, and wheat are the main crops.

Natural Resource Use

Finley Creek flows east and south of the site, while the north and west sides drain into an unnamed ditch. This ditch lies between NSL and ECC. Finley Creek (less than 1 mile from the site) flows into Eagle Creek about ½ mile downstream from the site. Eagle Creek flows south for 10 miles before it empties into Eagle Creek Reservoir (9 miles from the site), which supplies approximately 6% of the drinking water for the city of Indianapolis. Surface water use downstream, within 3 miles of the site, is used for fishing and wading by area residents. The unnamed ditch and Finley Creek are very shallow in the immediate vicinity of the ECC site and therefore not conducive for recreational activities. There are 1,760 persons within 3 miles of the site who use private residential wells for all domestic purposes. The nearest residential well is about 1,000 feet west of the site with a well depth of 40 feet.

Hydrogeology

In 1985, EPA conducted a very thorough hydrogeological investigation of the area around this site. This investigation included, but was not limited to, reviews of existing information; a search of historical aerial photographs, domestic and industrial well logs; and relevant literature. They then performed a subsurface exploration program to further define conditions at the site.

The major aquifers under the site are in sand and gravel deposits of glacial origin. Soil types consist of glacial tills, glacial outwash, and possibly some shallow alluvial deposits. The glacial till consists predominantly of clayey silt and silty clay. The glacial outwash was made up of fine to coarse sand and gravel that are highly permeable. The alluvial deposit consists of fine sand and silty sand. The south end of the site is shallow and appears to be very complex, consisting of a combination of till, outwash, and alluvial deposits.

Four hydrological units exist beneath the site. They all appear to be fairly continuous:

5-15 feet	-	Saturated zone, thick silty clay zone; appears to have relative low permeability.
20-30 feet	-	Shallow sand and gravel; may be semi-confined in some places.
30-150 feet	-	Clayey silt and silty clay zone, which appears to act as an aquitard.
150-165 feet	-	A confined, deep sand and gravel zone just above the top of the rock surface.

The direction of water flow in the shallow and deep sand and gravel aquifers is, in general, to the south toward Finley Creek. Along the southeastern edge of the site, groundwater flow is toward the east, and discharges to the unnamed ditch.

The former cooling pond intersected both the shallow sand and gravel aquifers. These aquifers may be semi-confined beneath much of the site due to lithologic variations between them and the thick silty clay zone. This variation may decrease the migration potential of contaminants from the saturated zone to the shallow sand and gravel zone.

D. Health Outcome Data

This section identifies the relevant, available databases; their evaluation occurs in the PUBLIC HEALTH IMPLICATIONS section. Cancer may be a plausible health outcome from long-term exposure to at least one of the contaminants of concern. The ISDH maintains a statewide cancer registry; however, data regarding cancer incidence by city and county are not yet available. In addition, the ISDH maintains a mortality database by county. Mortality data on Boone County cancer deaths are available (1950-1979). The public health implications of these data will be evaluated in the Health Outcome Data Evaluation subsection.

COMMUNITY HEALTH CONCERNS

The following community health concerns were taken from the summary of a public meeting held in April 1991 (EPA Public Meeting). The Boone County Health Department was contacted in March 1992 for any community health concerns in addition to those provided by IDEM.

1. How about toluene, methyl ethyl ketone, trichloroethene, or something of that nature; do you see those at the site?

2. What is the depth of contamination at the site?

The community health concerns listed will be addressed in the PUBLIC HEALTH IMPLICATIONS section of this public health assessment.

The health assessment was made available for public comment on June 21, 1993. No additional health-related concerns were reported. Responses to all comments received can be found in APPENDIX C.

ENVIRONMENTAL CONTAMINATION AND OTHER HAZARDS

The tables in this section list the contaminants of concern. We evaluate these chemicals in the subsequent sections of this public health assessment and determine whether exposure to them has public health significance. ATSDR selects and discusses a chemical as a contaminant of concern based upon the following factors:

1. the chemical has no comparison value and/or may be toxic to humans at specified levels;

2. the comparison of on-site and off-site concentrations with health assessment comparison values for (1) noncarcinogenic endpoints and (2) carcinogenic endpoints;

3. an evaluation of the field data quality, laboratory data quality, and sample design; and

4. community health concerns related to a particular chemical.

In the data tables that follow under the On-site Contamination and Off-site Contamination subsections, the listed chemical does not mean that it will cause adverse health effects from exposures. Instead, the list indicates which chemicals will be evaluated further in the public health assessment.

Comparison values for this public health assessment are contaminant concentrations in specific media that are used to select contaminants for further evaluation. Sample data provided are documented in the Final RI report. Any data that is estimated or below its detection limit is not used in this report. Please note that all data used has been qualified under the Quality Assurance and Quality Control section of this document.

The data tables include the following acronyms:

CREG = Cancer Risk Evaluation Guide. CREGs are estimated contaminant concentrations based on a one excess cancer in a million persons exposed over a lifetime. They are calculated from EPA's cancer slope factors.

EMEG = Environmental Media Evaluation Guide. EMEGs are media-specific comparison values that are used to select contaminants of concern at hazardous waste sites. They are derived from the minimal risk level.

LTHA = Lifetime Health Advisory (for drinking water). The LTHA is derived from the Drinking Water Equivalent Levels for noncarcinogens. For noncarcinogenic organic and inorganic compounds, LHAs are 20% and 10% respectively of the DWEL. For possible carcinogens, the LHA is divided by an additional factor of 10.

MCL = Maximum Contaminant Level (for drinking water). MCLs represent contaminant concentrations that EPA deems protective of public health (considering the availability and economics of water treatment technology) over a lifetime (70 years) at an exposure rate of 2 liters of water per day.

NAS = National Academy of Sciences. It has been suggested by the NAS, that where water supplies contain more than 20 ppm, dietary restriction to less than 1 g is difficult to achieve and maintain.

ppb = Parts per billion.

RfD = Reference Dose. EPA's estimate of the daily exposure to a contaminant that is unlikely to cause non-cancerous adverse health effects.

The Toxic Chemical Release Inventory (TRI) is an EPA database that contains information on chemical releases of industries in the United States. It is used to determine the potential sources of contamination near NPL sites. A computer search was conducted of all available toxic release inventory (TRI 87-90) data to determine the number of industries near the site within the City of Zionsville (zipcode = 46077). The data did not show any industries with chemical releases in Zionsville, Indiana during 1987 to 1991.

All chemicals found in sampled media have been assessed for adverse health effects and are listed in the tables in Appendix B at the end of this public health assessment. These tables also include the depth of soil samples (depths have been rounded), the location of all samples, and each chemical's sample concentration range.

A. On-Site Contamination

Subsurface Soil/Soil Boring

Soil sampling was performed in May and October 1984 at the ECC site in two phases (Figure 2, Appendix A). Two types of soil samples were collected at the ECC site, boring and surficial.

In Phase I (May 1984), soil borings were made at 15 locations and surficial samples were collected at 20 locations. Borings were not advanced more than 2½ feet below ground surface because of rocks and other debris. Surficial samples were generally no deeper than 6 to 8 inches below ground surface. The ATSDR definition of surface soil is samples taken at less than 3 inches. Because the samples taken at this site are a composite of 0-8 inches, these surface soil samples will be considered as subsurface.

Eleven borings were advanced in the north drum storage area to assess the depth and concentration of VOCs. Four borings were also advanced on the perimeter of the concrete pad, which served as the south drum storage area. Twelve subsurface soil samples (AA through AL) were collected on the large embankment along the north and northwest sides of the site. Three samples were collected in the polymer pit area (Pits N, DC, 6 and S). Three samples (AM-SW, AO-SE, and AP-SE) were also collected adjacent to the south concrete storage pad. One surface composite sample (N of C) was collected from the drum storage area between the concrete pad and the lagoon.

No inorganic analyses were run on the samples collected in May.

In the Phase II (October 1984) soil sampling effort, nine soil borings were advanced through the south concrete pad to a maximum depth of 12½ feet (Figure 3, Appendix A). Intermediate boring depths ranged from 2 to 5 feet, while deep boring depths ranged from 5 to 9 feet.

Inorganic contamination of the soil is apparently greatest in the near surface (0-3 feet) soil in northern portions of the site. This contamination extends to depths of at least 5 feet, although it is less widespread than observed in the overlying shallow soil.

Organic contaminants at the site are VOCs and phthalates. Organic contamination decreases with depth in the variety of compounds and their associated concentrations. They were detected, however, at the maximum depth of sample analysis (8½ feet).

A contaminant of concern was selected from Phase I or II based on the highest concentration found in either Phase. The contaminants of concern in the subsurface soil/soil borings are listed in Table 1.

Table 1. Contaminants of Concern in On-Site Subsurface Soil (SS) and Soil Boring (SB) Samples.

Chemical		Sample Depth (Feet)	Sample Location Number	Concentration Range - ppb	Comparison Value	
					ppb	Source
Organic Chemicals						
aldrin	(SB)	1	AN - B6	10-210	41	CREG
aroclor-1016 (PCB)	(SS)	N/A	N of P	10,800	*	
aroclor-1232 (PCB)	(SS)	N/A	N of P	16,200	*	
aroclor-1248 (PCB)	(SS)	N/A	N of P	10,800	*	
2-butanone	(SS) (SB)	0-1 1-2	AO-SE D7-B6	5,200 89,600-99,200	*	
chloromethane	(SS)	0-1	AA	70	*	
1,4-dichlorobenzene	(SS)	0-1 (AO-SE only)	AO-SE & N of P	33,700-570,000	*	
1,1-dichloroethane	(SS) (SB)	0-1 1	AP-SE AN	700 60	*	
4,4-DDD	(SB)	1-2	AE-AG & D7	1,080-5,900	2,900	CREG
4,4-DDT	(SB)	1-2	An - D7	40-36,000	2,100	CREG
dimethyl phthalate	(SB)	1	AE-AG	25,400	*	
di-n-butyl phthalate	(SS) (SB)	0-1 1-2	AD-SE - N of PD D7 AE-AG	67,900-79,000 11,000-112,200	*	
di-n-octyl phthalate	(SS) (SB)	0-1 1	AC-AM-SW AE-AH - B6	10K-127,800 8,900-300,000	*	
endosulfan sulfate	(SS) (SB)	N/A 2	N of PD - N of P D7	3,300-4,000 19,000	*	
endrin aldehyde	(SB)	2	D7	20,000	*	
gamma-BHC (lindane)	(SS) (SB)	N/A 1-2	N of PD B6 - D7	760 170-540	*	
2-hexanone	(SB)	2-4	SB-04 & SB-08	70-1,600	*	
2-methylnaphthalene	(SS) (SB)	0-1 (AM-SW only) 1	AM-SW - N of P AE-AH - B6	7,200-104,000 8,800-130,000	*	
4-methyl-2-pentanone	(SS) (SB)	0-1 (AO-SE only) 1-2	AO-SE - N of P B6-D7	730-2,600 7,600-29,600	*	
4-methylphenol	(SS) (SB)	0-1 (AM-SW only) 1-2	AM-SW - N of PD D7-B6	52,000-535,600 31,000-510,000	*	
naphthalene	(SS) (SB)	0-1 (AO-SE only) 1	AO-SE - N of PD AE-AH - B6	1,500-55,700 26,100-470,000	*	

Chemical		Sample Depth (Feet)	Sample Location Number	Concentration Range - ppb	Comparison Value	
					ppb	Source
n-nitrosodimethylamine	(SS)	0-1	AO-SE	9,900	14	CREG
n-nitrosodipropylamine	(SS)	0-1	AO-SE	12,000	100	CREG
phenanthrene	(SB)	1-2	AE-AH & D7	4,600-8,000	*	
2,3,7,8-tetrachlorodibenzo-p-dioxin	(SB)	1-2	D7 - B6	6-8	*	
tetrachloroethene	(SS) (SB)	0-1 1-2	AO-SE - AM-SW AE-AH - D7	570-4,116,000 131,000-744,100	500,000	RfD
toxaphene	(SS)	N/A	N of P	10,800	640	CREG
1,1,1-trichloroethane	(SS) (SB)	0-1 (AO-SE only) 1	AO-SE -N of P AN - B6	17,500-7,411,400 40-1,203,200	*	
trichloroethene	(SS) (SB)	0-1 (AL only) 1	AL - N of P AN - B6	2-6,080,200 60-2,135,700	*	
Inorganic Chemicals						
lead	(SB) (SB)	2-4 5-9	SB-05 SB-05 & SB-09	5,600-26,000 4,500-17,000	*	
nickel	(SB) (SB)	2-4 5-9	SB-09 & SB-08 SB-05 & SB-01	13,000-24,000 13,000-20,000	*	
tin	(SB)	2-4	SB-05 SB-04	17,000-30,000	*	

* No comparison value available

Groundwater - Monitoring Wells

A three-phased groundwater sampling program was conducted at the ECC site. During the first phase sampling effort, two on-site monitoring wells (MW-1A and MW-2A) were found to be covered with concrete and were inaccessible. During the phase two sampling effort, these two wells were again inaccessible. Additional monitoring wells were installed. All monitoring wells were installed off-site, however, except monitoring well 8A (Figure 4, Appendix A). This well was installed in the shallow aquifer at a depth of approximately 30 feet. Chemical contamination in monitoring well 8A was detected during Phase III of the sampling program. Samples were analyzed for organic and inorganic chemicals.

Contaminants of concern in this on-site groundwater monitoring well are listed in Table 2.

Table 2. Contaminants of Concern in On-Site Groundwater Samples (Well 8A), Phase III.

Chemical	Concentration Range - ppb	Comparison Value	
		ppb	Source
1,1-dichloroethane	6	*	
1,1,1-trichloroethane	7	*	
trichloroethene	21	5	MCL

* No comparison value available

B. Off-Site Contamination

Surface Water and Sediment

Surface water and sediment samples were collected in July 1983 from Finley Creek, Eagle Creek, and an unnamed ditch east of the site.

The scope of the surface water and sediment sampling effort included the following: five surface water samples, one surface water duplicate sample, one surface water field blank, six sediment samples, one sediment duplicate sample, and one sediment field blank. Surface water sample numbers included SW-001, -002, -003, -004-001, and duplicate sample 004-002 (Figure 5, Appendix A). Sediment sample numbers included SD-001, -002, -003, -004-001, duplicate-004-002, -005, and -006 (Figure 6, Appendix A).

Contaminants of concern in the off-site surface water and sediment samples are listed in Table 3.

Table 3. Contaminants of Concern in Off-Site Surface Water and Sediment Samples, July 1983.

Chemical	Surface Water		Sediment		Comparison Value	
	Sample Location Number	Concentration Range (ppb)	Sample Location Number	Concentration Range (ppb)	ppb	Source
Organic Chemicals						
chloroethane	SW-004	120	-	-	*	
1,1-dichloroethane	SW-004	45	-	-	*	
4-methylphenol	-	-	SD-004	960	*	
vinyl chloride	SW-004	10	-	-	0.7	EMEG
Inorganic Chemicals						
cyanide	SW-001 SW-002	<1	-	-	200	MCL
lead	-	-	SD-006 SD-005	6,800-48,000	15	A
nickel	-	-	SD-001 SD-005	<4,000-23,000	*	
thallium	-	-	SD-004 SD-005	<500-<1,100	*	
tin	-	-	SD-004 SD-003	<1,000-<2,000	*	
vanadium	-	-	SD-004 SD-002	<10,000-23,000	*	
zinc	-	-	SD-001 SD-002	<29,000-75,000	*	

* No comparison value available
A EPA Action Level

Groundwater - Residential Wells

The residential well sampling effort was performed in May 1983. The general well selection strategy was to select residential wells that would adequately characterize water quality in the shallow drinking water aquifer (40 feet or less) in the immediate vicinity of the site. Available hydrogeologic information, well construction details and well logs were reviewed prior to selection of the residential wells sampled during this effort. The residential well sampling effort at the site included the following samples: five residential well samples

ECC-RW003, RW006, and RW007 (downgradient of the site), RW004 (upgradient of the site), RW005 (west of the site); one residential well duplicate sample (RW005-002); and one field blank (ECC-RW001-001). (Figure 7, Appendix A)

All wells were pumped for 20 to 30 minutes prior to sampling. Samples were collected at the faucet closet to the wellhead, and upstream of any water conditioning devices (e.g., water softener, iron filter, etc.). Samples were collected by filling the sample bottles directly from the faucet. Distilled water for the field blank sample was obtained from the ISDH.

Organic analysis of residential well water samples failed to detect any of the chemicals sampled for. Contaminants of concern in the residential wells are listed in Table 4.

Table 4. **Contaminants of Concern in Off-Site Residential Well Groundwater Samples, May 1983.**

Chemical	Sample Location Number	Concentration Range - ppb	Comparison Value	
			ppb	Source
sodium	RW005 RW003	15,300-381,000	20,000	NAS

Groundwater - Monitoring Wells

A three-phased groundwater sampling program was conducted during 1983 and 1984 at the ECC site: (I) July 1983, (II) November 1983, (III) December 1984.

The scope of the Phase I effort at the site included the following: twelve groundwater monitoring well samples, two groundwater duplicate samples, and one groundwater field blank. Monitoring well (MW) numbers included ECC-1A, 1C, 2A, 2B, 2C, 3A, 3C, 4A, 4C, 5A, 6A, 7A, 9A, 10A, 11A; and MW-1A and MW-2A (Figure 4, Appendix A).

During the first phase sampling effort, only nine wells were sampled. One well (ECC-4A) was not sampled because of oil contamination.

The scope of the Phase II groundwater sampling effort included the following: 13 groundwater monitoring well samples, two groundwater duplicate samples, and one groundwater field blank.

During the second phase of the sampling effort only 11 wells were sampled. The sampled wells included the nine wells sampled in Phase I and two new wells (ECC-6A and ECC-7A) along the eastern boundary of the site. The well (ECC-4A) found to be contaminated during

the first phase sampling effort was not included in the scope of work for Phase II groundwater sampling.

The scope of the Phase III groundwater sampling effort included the following: ten groundwater monitoring well samples, one groundwater duplicate sample, and one groundwater field blank.

During the third phase of the sampling effort, only the wells in the shallow aquifer were sampled. This included the six shallow wells sampled in Phase II and four wells installed in October and November 1984. Due to the slow recharge to the wells, only organic chemical samples were obtained from ECC-9A and ECC-11A.

Additional monitoring wells have been installed off-site as observed during the site visit that were not a part of the Final RI report.

The contaminants of concern in the groundwater monitoring wells are listed in Table 5.

Table 5. Contaminants of Concern in Off-Site Groundwater Samples, Phase I, II, & III.

Chemical	Phase I July 1983		Phase II November 1983		Phase III December 1984		Comparison Value	
	Sample No.	Concentration Range ppb	Sample No.	Concentration Range ppb	Sample No.	Concentration Range ppb	ppb	Source
Organic Chemicals								
chloroethane	3A-002 3A-001	116-120	3A	41	10A-001 7A-001	29-90	*	
chloromethane	-	-	-	-	3A-001	100	3	LTHA
1,1-dichloroethane	3A	86-96	3A	51	10A-001 3A-001	8-10	*	
1,2-dichloroethane	-	-	-	-	10A-001 11A-001	3-4,000	0.38	CREG
trichloroethene	3A-002 3A-001	7-9	1A-01 1A-02	<9	9A-001 11A-001	3-28,000	5	MCL
vinyl chloride	3A-002 3A-001	6-7	3A-01	86	-	-	0.2	EMEG
Inorganic Chemicals								
aluminum	3A-002 5A-001	320-1,720	6A-01 7A-01	<200-61,500	2A-001 1A-001	65-304	*	
antimony	5A-001	4	1A-01	<20	-	-	4	RfD
barium	2B-001 1C-001	150-660	2B-01 3A-01	188-1,070	2A-001 3A-001	287-868	700	RfD

Chemical	Phase I July 1983		Phase II November 1983		Phase III December 1984		Comparison Value	
	Sample No.	Concentration Range ppb	Sample No.	Concentration Range ppb	Sample No.	Concentration Range ppb	ppb	Source
manganese	2C-001 3A-001	17-260	4C-01 7A01	23-1,930	2A-001 6A-001	49-94	1,000	RfD
nickel	3A-001 3A-002	42-77	6A-01 7A-01	<40-176	5A-001 3A-001	32-84	100	LTHA
sodium	-	-	-	-	1A-001 3A-001	10,060-380,700	20,000	NAS

* No comparison value available

Aquatic Biota

Two studies, a bioaccumulation study on freshwater mussels and a biological assessment of stream ecosystems, have been performed in the vicinity of ECC.

In the first study, the ISDH suspended live freshwater mussels, (*Lampsilis radiata siluoides*) in wire baskets at four locations (two upstream and two downstream of the site) on April 24, 1981, (Figure 8, Appendix A). On June 9, 1981, mussels were taken out of the stream, wrapped in solvent-rinsed aluminum foil, and kept frozen until analyzed. Each sample consisted of five mussels.

The second study was performed by the Department of Zoology at Depauw University from 1978 to 1980 as part of a larger biological monitoring program of fish populations and benthic macroinvertebrates. One of the areas studied was the Eagle Creek watershed, including Finley Creek. Fish were collected using an electric seine. Samples were collected both upstream and downstream (Figure 9, Appendix A). Sampling normally took place once a month in May, June, July, August, and October in 1978, 1979, and 1980.

Results from the mussel bioaccumulation study showed that the only contaminant found downstream at levels higher than upstream of the ECC site was arsenic.

Results of the biological monitoring program assessment of the fish population showed that the fish population downstream is smaller than upstream of the site. Samples taken downstream also consistently ranked lower in density, biomass, or number of families than upstream samples.

Environmental Data Gaps

Due to the lack of off-site surface soil samples and ambient air monitoring, it is not possible to characterize the extent of contamination found in these media. It is also difficult to characterize the site as the source of groundwater contamination, as only one on-site monitoring well is functional.

C. Quality Assurance and Quality Control

In preparing this public health assessment, the ISDH relies on the information provided in the referenced documents and assumes that adequate quality assurance and quality control measures were followed with regard to chain-of-custody, laboratory procedures, and data reporting. The validity of the analysis and conclusions drawn from this public health assessment are determined to be complete and comprehensive except for the following noted contaminations and detections of chemicals below quantification limits that were deemed unacceptable for use.

Sub-Surface Soil and Soil Borings

The laboratory was only able to estimate the levels of benzoic acid in the subsurface soil and soil boring samples. The chemicals di-n-butyl phthalate, beryllium, cobalt, and vanadium were found below the laboratory quantifiable levels in the soil samples. These chemicals will not be evaluated further as contaminants of concern in this medium.

Groundwater - Monitoring Wells

Methylene chloride was found in nearly all samples and field blanks. It was used in preparatory cleaning of the vials used for the samples. Acetone also was found in numerous samples as well as field blanks. Reagent grade acetone was used for equipment decontamination. Tetrachloroethene and trichloroethene were detected in wells 1A, 2A, and 5A at levels less than the laboratory quantification limit during the November 29-30 sampling events. Chrysene was also detected below the laboratory quantifiable limit. The values for the following chemicals were estimates only: benzene, thallium, tin, vanadium and magnesium. The chemical 2-butanone was found in the associated laboratory blank and is considered a laboratory contaminant.

Residential Wells

Results indicate the reliability of the inorganic analysis to be strongly suspect and not considered useable. Previous analysis of residential well samples did not find inorganic chemicals exceeding water quality standards with the exception of one sample (RW005). Organic contamination was not found in any residential wells although acetone was reported in one sample, which was likely introduced during sampling. Reagent grade acetone was used for equipment decontamination. It was found in numerous samples as well as field blanks. Quality assurance data indicate that boron analyses are invalid because of contamination in the preparation blank.

Surface Water and Sediment

Mercury was found at SW-003 and SW-004 though detection in the field blank indicates it to be a sampling or laboratory contaminant. Beryllium, methylene chloride, o-xylene, and

tetrachloroethene were detected in surface water samples; however, concentrations were below laboratory quantifiable limits. Contamination of samples by methylene chloride is probably due to sample bottle contamination. Bis(2-ethylhexyl)phthalate was also detected in the upstream sample SW-002, but only in concentrations below the laboratory quantifiable limit.

D. Physical and Other Hazards

As mentioned in the Site Visit subsection, the site is only accessible through the main entrance. Because methane gas is vented at Northside Sanitary Landfill (borders the ECC site on the east side), the potential hazards from buildup of gas to explosive levels is limited. Possible physical hazards present on-site are drums and two old buildings, which are in a deteriorating state. These buildings, however, are scheduled to be removed during the remediation of the site.

PATHWAYS ANALYSES

To determine whether nearby residents are exposed to contaminants migrating from the site, ATSDR evaluates the environmental and human components that lead to human exposure. This pathways analysis consists of five elements: a source of contamination, transport through an environmental medium, a point of exposure, a route of human exposure, and an exposed population.

ATSDR categorizes an exposure pathway as a completed or potential exposure pathway if the exposure pathway cannot be eliminated. Completed pathways require that the five elements exist and indicate that exposure to a contaminant has occurred in the past, is currently occurring, or will occur in the future. Potential pathways, however, require that at least one of the five elements is missing, but could exist. Potential pathways indicate that exposure to a contaminant could have occurred in the past, could be occurring now, or could occur in the future. An exposure pathway can be eliminated if at least one of the five elements is missing and will never be present. We assume that all individuals working on-site follow the site specific health and safety plan, thus they are not considered as exposed populations.

Table 6 identifies the completed exposure pathways, and Table 7 identifies the potential exposure pathways. The discussion that follows these two tables incorporates only those pathways that are important and relevant to the site. We also discuss some of those exposure pathways that have been eliminated.

A. Completed Exposure Pathways

Off-Site Groundwater/Residential Wells

Results of the hydrogeologic investigation have shown the existence of four hydrogeologic units in the area, a shallow saturated zone, a shallow sand and gravel aquifer, a clayey silt and silty clay zone, and a deep confined aquifer. Possible groundwater contaminant sources at the ECC site include the cooling water pond, and the surface storage areas and spill areas around the bulk tanks. Migration of soil contaminants to the shallow saturated zone has occurred on-site as evidenced by high levels of contaminants in well 11A. Further leaching of soil contaminants to the saturated zone is expected to be slowed due to the presence of a compacted silty-clay cap on the northern half of the site, and the continued existence of the concrete pad on the south half of the site.

The shallow sand and gravel aquifer has been shown to be contaminated with inorganic and organic chemicals in well 7A and lesser amounts of organics in wells 8A and 10A. The groundwater is locally confined in this aquifer with the hydrologic gradient being vertically upward. Because of the close proximity of the NSL site east of ECC, it cannot be definitively stated that the source of contamination in wells 3A and 7A is ECC, although the contaminants are consistent with those found on-site. Organic contamination in wells 8A and 10A is likely due to on-site soil at ECC since those wells are directly downgradient of ECC contaminated soil and not NSL.

Contamination of the shallow sand gravel aquifer may have occurred either via migration through the silty clay till on-site, or through contaminated water and sediment in the former cooling water pond. The cooling pond intersects the shallow sand and gravel aquifer.

The residents surrounding the ECC site all use private residential wells for their water supply. Sampling data on these wells indicate a high sodium contamination in this water. Adverse health effects could occur in individuals using private wells as their primary source of drinking water.

These private wells are also a potential pathway for residents to ingest, inhale, or be dermally exposed to site-related organic chemicals, which were found in the off-site monitoring wells, but not in the private wells. While these organic chemicals (Table 5) do not appear to have migrated to the residential wells, it must be assumed they have a potential of doing so because of the groundwater flow migrating from northeast to southwest.

Groundwater flow beneath the site is, in general, toward the south and discharges into Finley Creek. It flows in an easterly direction toward the unnamed ditch along the eastern edge of the southern half of the site.

Migration of contaminants to the nearest residential wells surrounding the site is not indicated, however, by the results of the residential well sampling.

The deep confined aquifer below the site has not been found to be contaminated. Contamination of the deep confined aquifer is unlikely because of the thick sequence of low permeability soils that act as a confining layer. Future migration of on-site contaminants to the deep aquifer is highly unlikely also due to the upward vertical hydraulic gradient. The most probable pathways for contaminant transport in the groundwater are through migration from the shallow saturated zone or from the shallow sand and gravel aquifer to the unnamed ditch or Finley Creek.

All chemicals found in the off-site groundwater at levels of health concern will be evaluated for their health effects in the Toxicological Evaluation subsection of this public health assessment.

Table 6. Completed Exposure Pathways

PATHWAY NAME	EXPOSURE PATHWAY ELEMENTS					TIME
	SOURCE	ENVIRONMENTAL MEDIA	POINT OF EXPOSURE	ROUTE OF EXPOSURE	EXPOSED POPULATION	
Off-Site Groundwater	ECC	Groundwater	Private wells	Ingestion, Inhalation, Dermal contact	Resident	Past Present Future

B. Potential Exposure Pathways

Off-Site Surface Soil/Dust Pathway

Although the ECC site was covered with a clay cap upon completion of surface cleanup activities, samples from ponding surface water indicated the presence of organic chemicals. The clay that was used to cap the ECC site was obtained from burrowed areas at NSL.

As part of the emergency response effort, one soil sample of the burrow material was analyzed for volatile organic priority pollutants and heavy metals. Low levels of inorganic chemicals were identified (below background concentrations) and extremely low levels of benzene, carbon tetrachloride, ethylbenzene, and toluene were detected in samples of the cap material. The concentrations of these chemicals in the cap material were below health comparison values and are not of concern. Below the cap, heavily contaminated soil could be a risk to receptor populations since any future excavation might bring contaminants to the surface.

Transport of contaminants from on-site soils is also likely to occur through leaching. As water infiltrates through the contaminated soil, it will desorb many compounds and eventually leach into the groundwater in the shallow saturated zone. This is presently the case as the groundwater samples from the shallow saturated zone were found to be contaminated with VOCs.

Because of the protective cap and vegetation on-site, the exposure through surface soil would be minimal. Surface soil samples of less than 3 inches have not been taken. In seasonal dry conditions during past and present on-site activities, contaminated windblown dust could travel to neighboring residences. Routes of exposure to residents surrounding the ECC site are inhalation, incidental ingestion, and dermal contact.

The extent of off-site surface soil contamination due to on-site accumulation and unauthorized discharge of contaminated storage water, poor management of drum inventory, unapproved burning of chlorinated hydrocarbons and other solvents, and several spills, is not known. Off-site surface soil sampling will be necessary to further evaluate this exposure pathway.

Off-Site Surface Water

A well-developed drainage pattern exists in the area surrounding the ECC site. The principal surface drainage areas are Finley Creek and its associated tributary, and Eagle Creek. Two minor surface drainage areas are adjacent to the site. The site is located outside the 100-year flood plain.

Natural surface water runoff from the area surrounding the site flows toward the unnamed tributary of Finley Creek, or toward Finley Creek. Surface water runoff from the northern part of the site largely flows south where a berm along the edge of the concrete pad redirects

runoff west to the ditch. Runoff from the concrete pad flows south and is routed through a pipe at the southeast corner of the site and to the unnamed ditch. Before capping, runoff was directed to the cooling pond and occasionally overflowed to the unnamed ditch.

Inorganic contamination of surface water does not appear to be occurring off-site in the vicinity of ECC. In the vicinity of ECC, inorganic sediment contamination is limited to lead in the unnamed ditch. Organic contamination of off-site surface water is limited to location SEW-004. ECC site records and chemical analysis data are consistent with the ECC site as the source of organic contaminants detected in location SW-004. Organic contamination of sediments possibly resulting from the ECC site was found at SD-005 (bis[2-ethylhexyl]phthalate) in the unnamed ditch and SD-004 in Finley Creek (4-methylphenol).

Individuals wading or participating in recreational activities in Finley Creek could potentially be exposed by dermal contact and less significantly by inhalation to site-related chemicals found in the off-site surface water. It is important to note, however, that because the exposure to site-related chemicals would not be for an extended period of time, this medium is not considered a main source of contaminant exposure to humans.

Sediment

Both the unnamed ditch and Finley Creek receive groundwater and surface water runoff from the ECC site. Contaminants in the surface water may volatilize, precipitate, or adsorb in sediments, or remain in solution and be transported downstream to Big Eagle Creek and eventually the Eagle Creek Reservoir. Individuals may be exposed by wading in the creek, incidentally ingesting contaminated water, or ingesting aquatic life which have bioaccumulated contaminants.

Contaminants in stream sediment may dissociate and re-enter the surface water. The contaminants can then be re-suspended during high water flow and carried downstream. During low water flow periods, contaminated sediments may be exposed along the stream banks and may be transported as dust.

Aquatic Life Pathway

As mentioned in the sediment pathway, both the unnamed ditch and Finley Creek receive groundwater and surface water runoff from the ECC site. Once contaminants enter the surface water, they will either volatilize, adsorb to sediment, or experience large dilutions before reaching the Eagle Creek Reservoir.

Mussels are bottom dwellers and feeders; therefore, they are likely to bioaccumulate contaminants found on sediments or in surface water. The levels of contaminants found in the bioaccumulation study in mussels may be indicative of the levels of contamination found in other aquatic life in Finley Creek.

Analysis results for contaminants found in mussels included lead, mercury, and arsenic. Lead and mercury were detected at levels below the Food and Drug Administration permissible levels. Arsenic was the only contaminant found downstream at levels higher than upstream. PCBs, dieldrin, and chlordane were not detected in the sample analysis. Individuals could be exposed indirectly to site-related contaminants by eating aquatic life caught in Finley Creek.

Table 7. Potential Exposure Pathways

PATHWAY NAME	EXPOSURE PATHWAY ELEMENTS					TIME
	SOURCE	ENVIRONMENTAL MEDIA	POINT OF EXPOSURE	ROUTE OF EXPOSURE	EXPOSED POPULATION	
Aquatic life	ECC	Aquatic life	Finley Creek	Ingestion	Residents	Past Present Future
Off-Site Sediment	ECC	Sediment	Finley Creek	Ingestion, Dermal Contact	Residents	Past Present Future
Off-Site Surface Water	ECC	Surface Water	Finley Creek	Ingestion, Dermal Contact	Residents	Past Present Future
Off-Site Surface Soil	ECC	Residences surrounding ECC site	Property surrounding ECC site	Ingestion, Inhalation, Dermal contact	Residents	Past Present Future

PUBLIC HEALTH IMPLICATIONS

In this section we will discuss the health effects of persons exposed to specific chemicals, evaluate state and local health data bases, if available, and address any existing community health concerns.

A. Toxicological Evaluation

This subsection of the public health assessment assesses the public health implication of contaminants that are associated with an exposure pathway that have not been eliminated in the PATHWAYS ANALYSES section.

ATSDR has developed toxicological profiles on several chemicals that have been found at this site. These profiles provide information on health effects, environmental transport, human exposure, and regulatory status.

Sodium was the only chemical measured in drinking water wells above its comparison value. Therefore, possible adverse health effects from ingestion of the maximum concentration of sodium will be discussed later. A toxicological profile for sodium has been provided below along with a toxicological profile for each of the contaminants of concern found in the on-site groundwater.

Calcium, cobalt, iron, magnesium, and potassium are considered to be essential human nutrients. They can, however, exhibit toxic properties at high levels of exposure. The levels of these chemicals in the groundwater would not pose any health concern.

Aluminum

Aluminum is not considered a contaminant of concern in the soil as it is one of the most common natural constituents of soil; and, because it was found at levels much lower than the average adult daily intake, as well as lower than the levels normally found in soil in the eastern United States.

The concentrations of aluminum in off-site groundwater, however, could cause adverse health effects to individuals using: (1) existing residential wells in the future should they become contaminated at comparable levels, or (2) any newly installed residential wells. If persons should install a well into the contamination zone containing the maximum concentrations of aluminum, these persons could be exposed to an estimated dose greater than the EPA proposed Secondary Maximum Contaminant Level for drinking water (.05 ppm), but considerably lower than the level at which adverse health effects have been observed in research. (ATSDR Toxicological Profile for Aluminum).

It is important to note, however, that aluminum has not been shown to cause cancer in animals. Also, when aluminum is taken orally, very little goes from the stomach into the bloodstream. Most aluminum leaves the body quickly in the feces. The small amount that does enter the bloodstream leaves in the urine. This chemical is a potential contaminant of residential wells.

Sodium

Long-term ingestion of high concentrations of sodium are believed to be associated with the development of hypertension and would complicate clinical treatment of hypertensive patients on salt-restricted intakes. Because intake restrictions of sodium are often part of hypertensive therapy, the levels of sodium in the off-site residential wells could represent a significant health concern to residents who use private wells as their primary source of drinking water.

Typically, prescribed low-sodium diets attempt to limit sodium intake from food and water to either 2.0, 1.0, or 5.0 grams (g) in a 24-hour period. It has been suggested by the National Academy of Sciences (NAS) that, where water supplies contain more than 20 ppm, dietary restriction to less than 1.0 g is difficult to achieve and maintain. (NAS 1977)

Antimony

Antimony is a soft metal insoluble in water and organic solvents. It was found in off-site groundwater at 4 ppb. This chemical was not found in the residential wells. Antimony is primarily considered a skin irritant. The RfD for antimony is 0.4 μg/kg/day. The levels of antimony typically found in soil in the eastern United States, however, is 9,000 ppb. Adverse health effects are not expected from exposure to this chemical at the specified levels. (Sittig. Handbook of Toxic & Hazardous Chemicals)

Chloroethane

Chloroethane is also called ethyl chloride. Most chloroethane released into the environment ends up as a gas in the atmosphere, but small amounts may enter groundwater as a result of filtration through soil. Once in the atmosphere, chloroethane breaks down fairly quick by reacting with substances in the air.

Chloroethane will most often enter the body through inhalation, although it may also enter the body through contaminated drinking water. It is not known if chloroethane produces cancer in humans. There is no oral chronic Minimal Risk Level (MRL) for this chemical but there is an intermediate inhalation MRL. Unfortunately, air monitoring has not been done for this site, thus an estimated daily inhalation dose exposure cannot be calculated. The MRLs are estimates of levels posing minimal health risk to humans. They include adjustments to reflect human variability and extrapolation of data from laboratory animals to humans. (ATSDR Toxicological Profile for Chloroethane)

Chloroethane was found at 120 ppb in the off-site groundwater. The possible routes of exposure are through ingestion, dermal contact, and inhalation. The health effects resulting from short- or long-term human ingestion, or exposure to water containing chloroethane, are not known. This chemical was not found in the residential wells. At present, chloroethane is a potential contaminant of private wells surrounding the ECC site.

Chloromethane

Chloromethane is a naturally occurring chemical that is made in large amounts in the oceans and is produced by some plants and rotting wood, and when materials such as grass, wood, charcoal, and coal are burned. Since chloromethane is continuously released into the atmosphere from oceans and biomass, a very low concentration will always be present.

The health effects resulting from short- or long-term exposure of humans to water containing specific levels of chloromethane are not known. (ATSDR Toxicological Profile for Chloromethane)

Chloromethane was found in off-site groundwater at 100 ppb. A chronic health guideline for ingestion of this chemical, such as an MRL, has not been determined. There is a chronic inhalation MRL of chloromethane. An estimated daily inhalation dose cannot be calculated because of the lack of air monitoring data for this site. Based on the sampling data, there is currently no one exposed to this chemical through the residential private wells.

1,1-Dichloroethane

The chemical 1,1-dichloroethane is a manmade liquid. It evaporates quickly at room temperature and has an odor like ether. It is used to remove grease, and to dissolve other substances such as paint, varnish, and finish removers. (ATSDR Toxicological Profile for 1,1-Dichloroethane)

This chemical was found in the off-site groundwater at 96 ppb. It was selected as a contaminant of concern because reliable information on how this chemical affects human health is not available. There are no regulatory standards or advisories for 1,1-dichloroethane. It is important to note that this chemical is only a potential contaminant of residential wells near the ECC site. No one is currently exposed to this chemical.

Trichloroethylene

Trichloroethylene, or TCE, is a manmade chemical that does not occur naturally in the environment. It is mainly used as a solvent to remove grease from metal parts.

TCE can easily enter the body through ingestion, inhalation, or dermal contact. This chemical is not likely to build up in the body. Exposure to high levels of trichloroethylene can cause dizziness, sleepiness, and damage to some of the nerves of the face. It has caused

rashes in some individuals who were exposed dermally. It is not known if this chemical causes cancer or will affect human reproduction. (ATSDR Draft Toxicological Profile for Trichloroethylene)

The intermediate MRL for trichloroethylene is 100 μg/kg/day, which assumes exposure for longer than 14 days, but less than 1 year. The estimated daily ingestion dose is considerably lower than the intermediate MRL. TCE was not found in the last sampling of the residential wells. This chemical is a potential contaminant of private residential wells.

Vinyl Chloride

Almost all vinyl chloride is manmade. Most of the vinyl chloride produced in the United States is used to make polyvinyl chloride (PVC). PVC is used to make a variety of plastic products including pipes, wire and cable coatings, and packaging materials. (ATSDR Toxicological Profile for Vinyl Chloride)

Exposure to vinyl chloride is most likely to occur by inhalation. Vinyl chloride does not enter the body by passing through the skin. Most of the vinyl chloride is gone from the body a day after it has been inhaled or swallowed. The liver, however, makes some new substances that do not leave the body as rapidly. A few of these substances are more harmful than vinyl chloride because they react with chemicals inside of the body and interfere with the way the body uses or responds to these chemicals. It takes more time for the body to get rid of these changed chemicals, but eventually the body will remove them as well.

Based on animal and human studies, it has been determined that vinyl chloride is a known human carcinogen. Studies of long-term exposure in animals show that increases in cancer may occur at very low levels of vinyl chloride in the air.

Vinyl chloride was found in the off-site groundwater at 86 ppb. An estimated daily ingestion dose was calculated. The results were much higher than the chronic oral MRL for this chemical. At this level of exposure cancer has been observed in humans; however, no one is presently exposed to this chemical at the specified levels.

B. Health Outcome Data Evaluation

As discussed in the Health Outcome Data subsection, cancer mortality data on Boone County, Indiana, and the United States are available by race, gender, and year. The cancer rates of Boone County were compared to Indiana and U.S. cancer rates (1950-1979). The organs that are affected by site-related chemicals are the central nervous system, liver, lungs, heart, and kidneys. The cancer rates for Boone County for this system and these organs are comparable to state and U.S. rates for all race/gender groups.

C. Community Health Concerns Evaluation

1. How about toluene, methyl ethyl ketone, trichloroethene, or something of that nature; do you see those at the site?

These three chemicals were found in the on-site surface soil and soil borings. Trichloroethene, or TCE, was the only one of the three chemicals found in the on-site groundwater. This chemical was not found in the residential wells, but it was found in the off-site groundwater monitoring wells. It is important to note, however, that there is no population currently exposed to this chemical except for remedial workers.

2. What is the depth of contamination at the site?

Soil borings were taken up to 12½ feet below the on-site surface soil. The lowest level at which contamination was found was 9 feet. The primary contaminants found at this level were inorganic chemicals.

In 1985 the entire site was capped and seeded. Below the cap, heavily contaminated soil could be a risk to receptor populations since any future excavation might bring contaminants to the surface.

Transport of contaminants from on-site soils is also likely through leaching. As water infiltrates through the contaminated soil, it will desorb many compounds and eventually leach into the groundwater in the shallow saturated zone. This is presently the case as the groundwater samples from the shallow saturated zone were found to be contaminated with volatile organic chemicals.

Because of the protective cap and vegetation on-site, the exposure to contaminants found in the subsurface or surface soil would be minimal. There is a potential, however, for individuals to be exposed to these contaminants through contaminated groundwater.

CONCLUSIONS

This site is a public health hazard. Evidence exists that exposures to sodium and potentially to chlorinated volatile organic compounds and inorganic chemicals has occurred in the past, are presently occurring, or are likely to occur in the future. The source of the sodium is not certain as it was found in the on-site soil, but not in the one on-site groundwater monitoring well. Site-related contamination could migrate to private wells.

1) The estimated exposures are to sodium and potentially to site-related substances at concentrations in the residential wells that, upon long-term exposures (greater than 1 year), can cause adverse health effects to any segment of the receptor population.

2) Aquatic life in Finley Creek may have bioaccumulated site-related inorganic and organic contaminants.

3) The off-site surface soil has not been sampled.

4) Existing ATSDR Toxicological Profiles for chloroethane, chloromethane, and 1,1-dichloroethane lack information that would allow a better assessment of the site's public health implications.

RECOMMENDATIONS

1) Provide frequent monitoring of residential wells for contaminant migration in groundwater.

2) Provide off-site groundwater monitoring designed to ensure that no contamination reaches the residential wells.

3) Provide drinking water to households with sodium contaminated private wells.

4) Inform residents with private wells of the possible health effects caused by the drinking of water containing high levels of sodium.

5) Implement institutional controls in the near future to prevent the use of the contaminated aquifer for drinking water supplies. Institutional controls are required until remediation has reduced contaminant concentrations to levels below levels of health concern.

6) Inform area residents of the potential dangers of eating aquatic species taken from Finley Creek.

7) Implement actions for monitoring, or other removal and/or remedial actions needed to ensure that humans are not exposed to significant concentrations of site-related chemicals in the off-site surface water.

8) Protect persons on and off the site from exposure to dusts or vapors that may be released during remediation.

9) Characterize off-site surface soil.

10) Provide remedial workers with adequate protective equipment and training in accordance with 29 CFR 1910.120, and follow appropriate National Institute for Occupational Safety and Health, and Occupational Safety and Health Administration guidelines.

Recommendations 7, 8, and 10 are part of the Consent Decree plans for the site.

Health Activities Recommendation Panel (HARP) Recommendations

In accordance with the Comprehensive Environmental Response Compensation, and Liability Act of 1980 as amended, ATSDR and the state have evaluated the Envirochem Corporation site for appropriate health follow-up activities. Due to the continued educational activities undertaken by IDEM and EPA, the human interaction with a pathway of exposure, and the

indications or allegations of adverse health outcomes, the following activities are recommended.

1) Provide immediate community health education to the exposed populations about the possible health effects from site contaminants and sodium, and about interim measures to reduce exposures.

2) Educate health professionals in Boone County about the potential health effects caused by site-related contaminants and sodium.

3) Consider whether substance-specific applied research should be conducted to identify a chronic MRL for ingestion, inhalation, and dermal exposure to chloroethane, chloromethane, and 1,1-dichloroethane.

If data become available that suggest human exposure is occurring, additional follow-up activities will be considered.

PUBLIC HEALTH ACTIONS

Based on the recommendations made in this public health assessment, the following public health actions have been or will be undertaken.

Actions Planned

1. The ISDH, Environmental Epidemiology Section will provide health education to two groups of individuals:

   a) Individuals who use private wells for potable water. These individuals will be provided information about potential adverse health effects that could occur if they are on sodium-restrictive diets.

   b) Individuals who live in the general community of the landfill. These individuals will be cautioned against eating aquatic biota taken from Finley Creek in the vicinity of the landfill. They will also be informed of the potential health risk involved if they did eat aquatic biota from Finley Creek.

2. The ISDH in cooperation with ATSDR, Division of Health Education, will provide health education to health professionals in Zionsville. This will consist of activities to improve the knowledge, skill, and behavior of health professionals in screening, surveillance, diagnosing, treating, and preventing injury or disease due to possible exposure to excess concentrations of sodium. This program will be initiated as resources permit.

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CERTIFICATION

The Envirochem Corporation Public Health Assessment was prepared by the Indiana State Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the public health assessment was begun.

Technical Project Officer, SPS, RPB, DHAC

The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health assessment, and concurs with its findings.

Director, DHAC, ATSDR

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APPENDICES

APPENDIX A - Figures

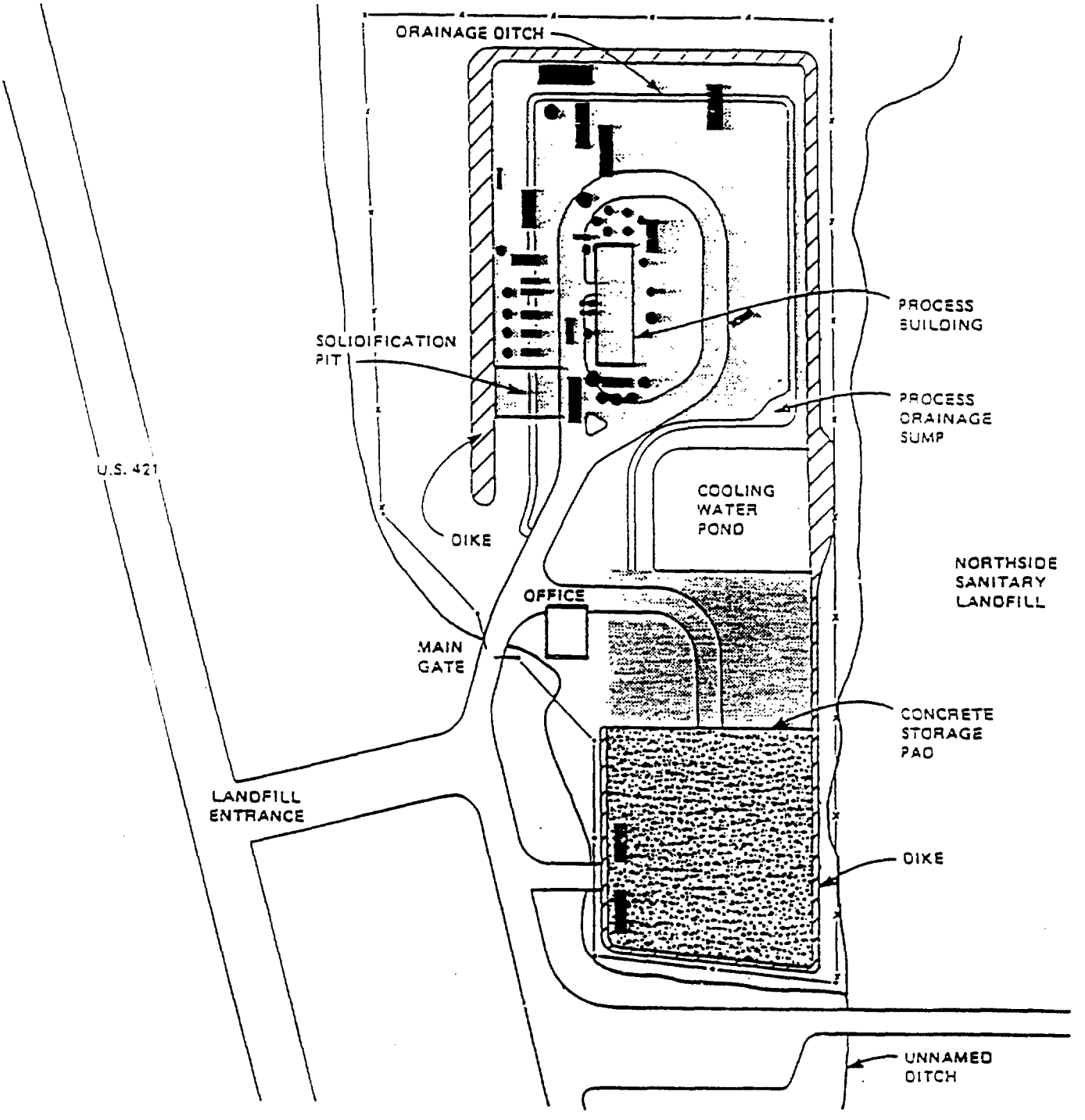
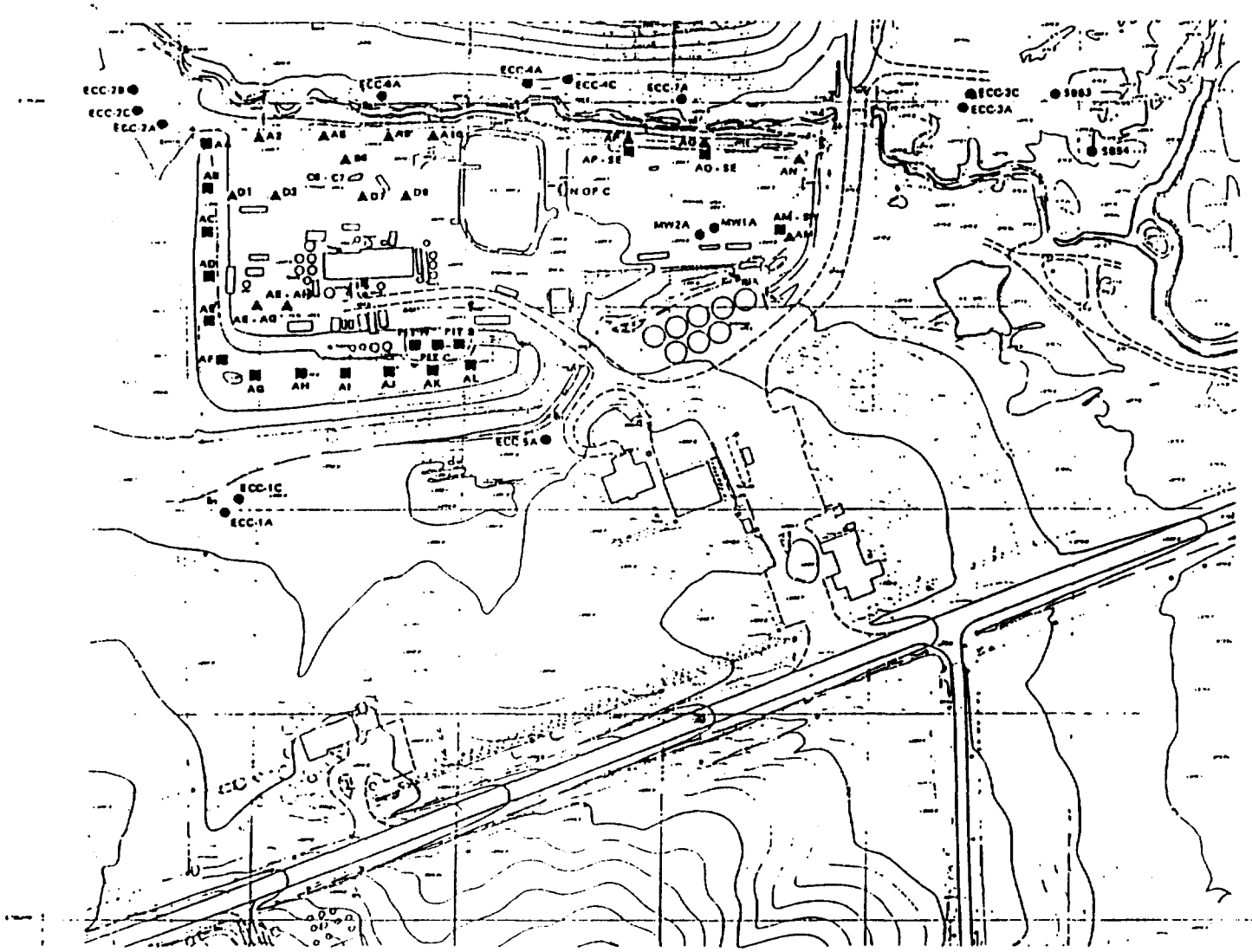


FIGURE 1
SITE MAP (1982)



LEGEND

- AK — SURFACE SOIL SAMPLE LOCATION
- A1 — SOIL BORING LOCATION
- C6-C7 — COMPOSITE SAMPLE AREA
- ECC-3A — MONITORING WELL OR PIEZOMETER

N

0 100 200
50 150
SCALE IN FEET

FIGURE 2
PHASE 1 SOIL BORING AND SURFACE SAMPLE LOCATIONS
ECC SITE
TM 3-4

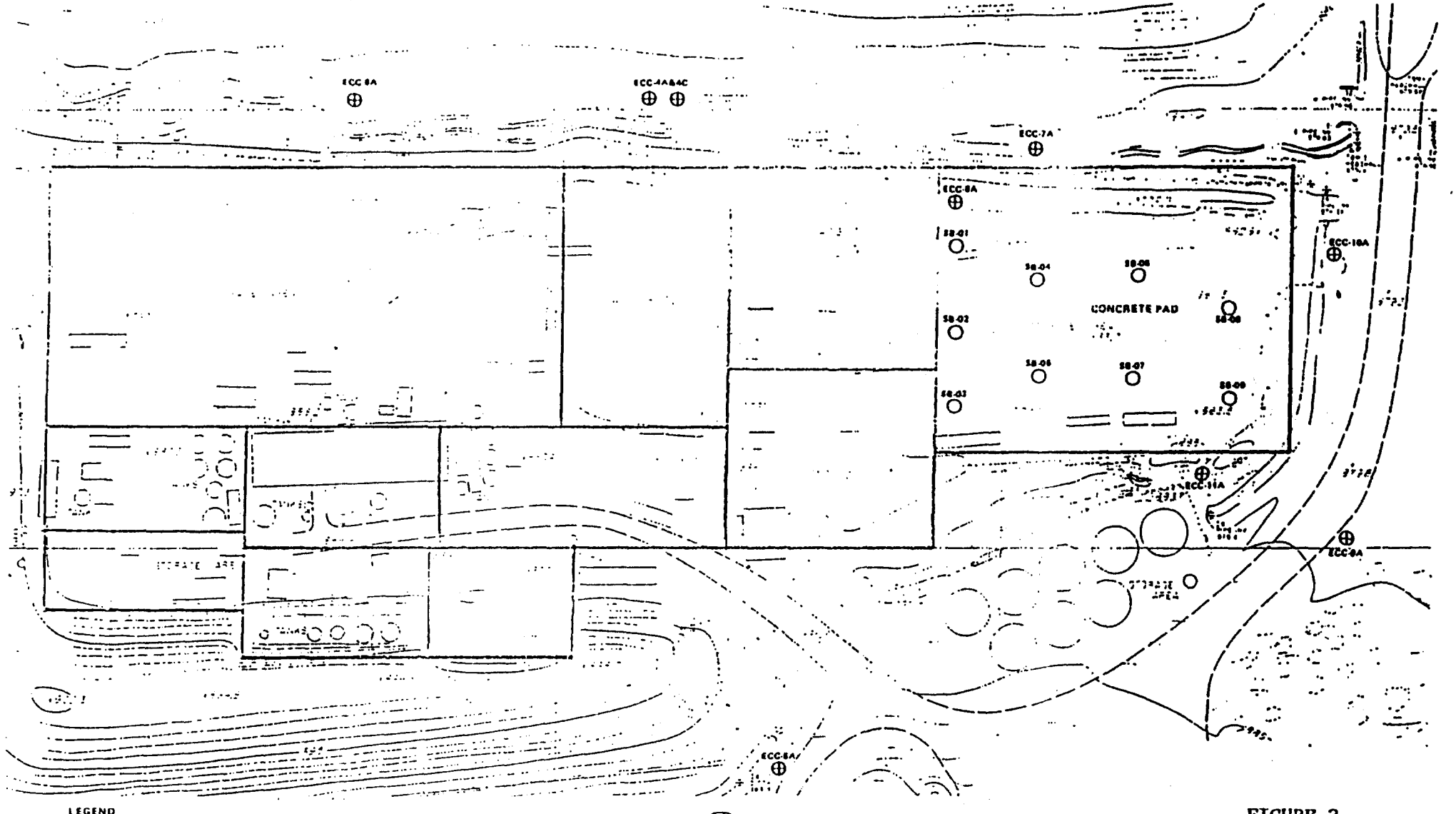
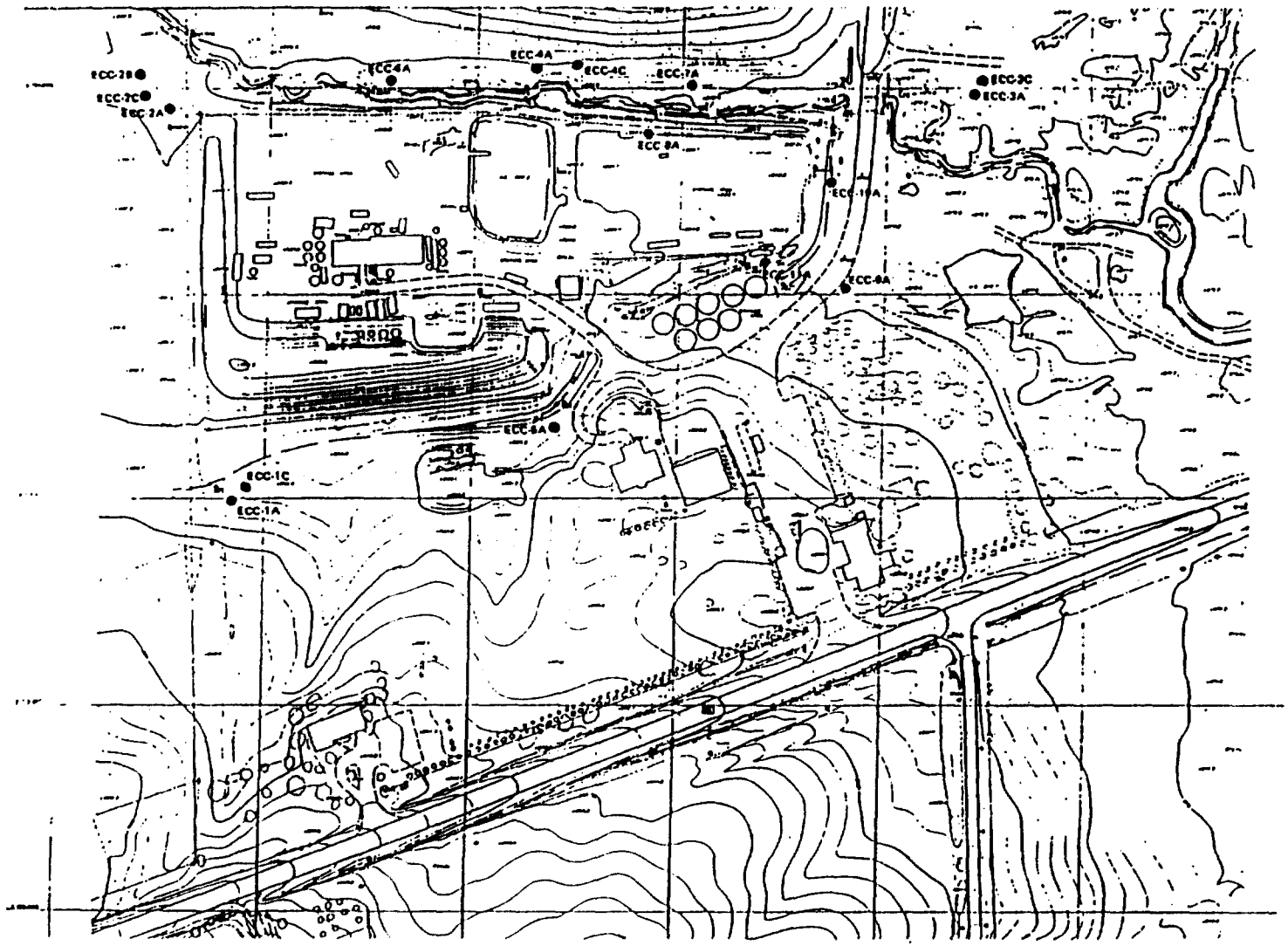


FIGURE 3

PHASE 2 SOIL BORING

ECC SITE
TM 3-4



LEGEND

● REMEDIAL INVESTIGATION MONITORING WELL
ECC-7A

NOTE: All well locations are approximate

N

0 100 200

SCALE IN FEET

FIGURE 4

MONITORING WELL LOCATIONS
ECC SITE
TM 3-2

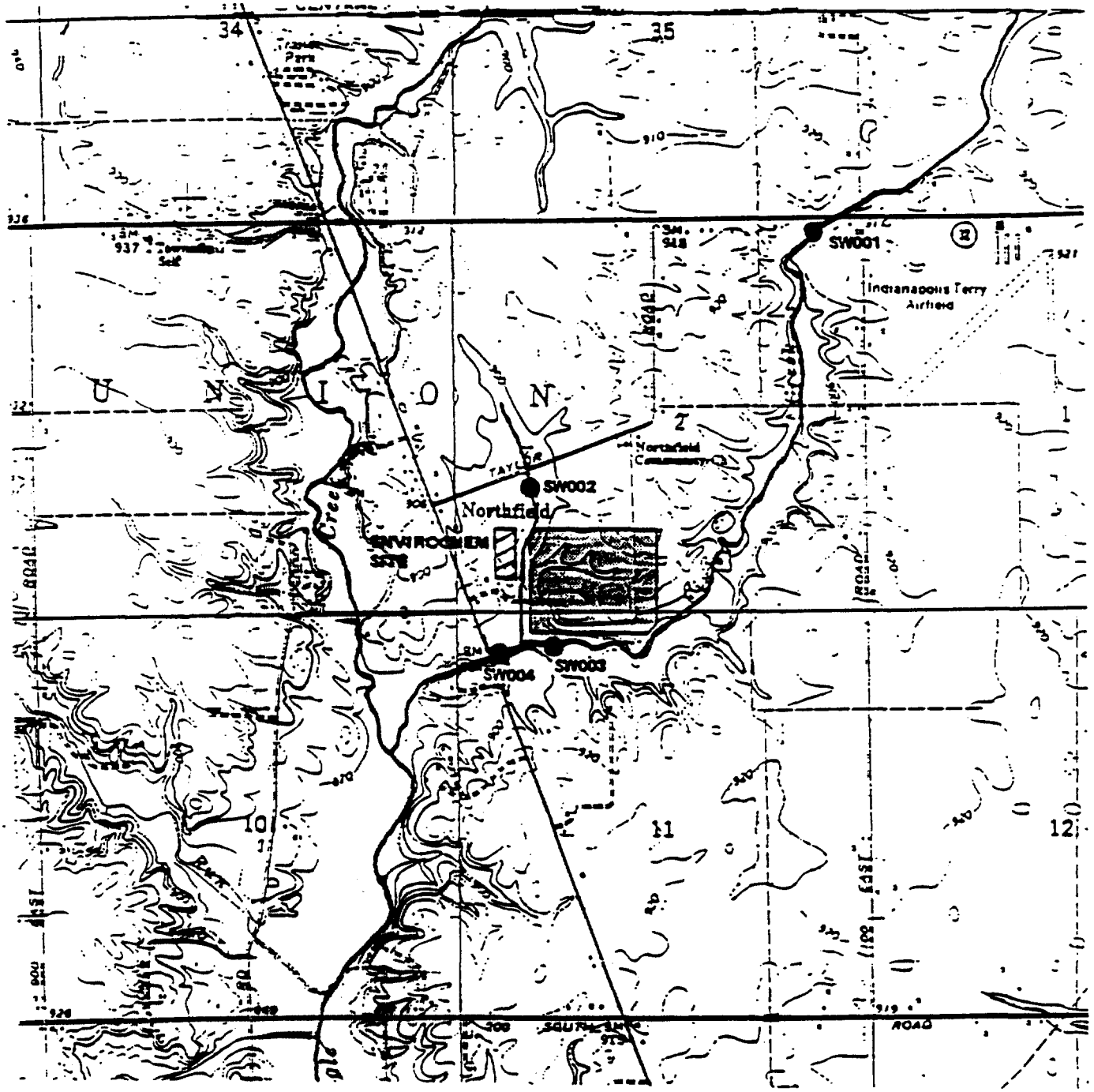


FIGURE 5
SURFACE WATER SAMPLING LOCATIONS
ECC SITE

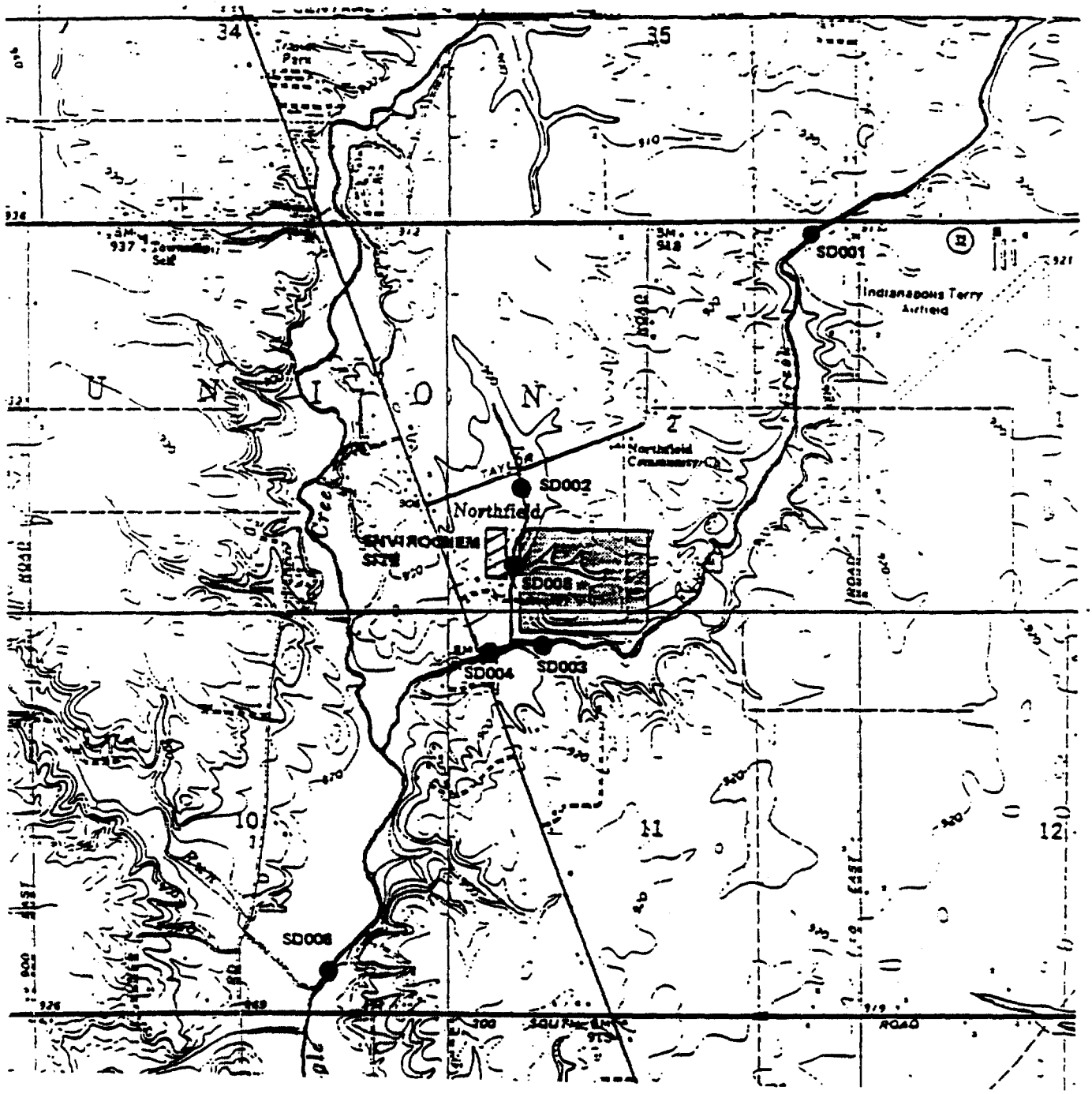


FIGURE 6
SEDIMENT SAMPLING LOCATIONS
ECC SITE

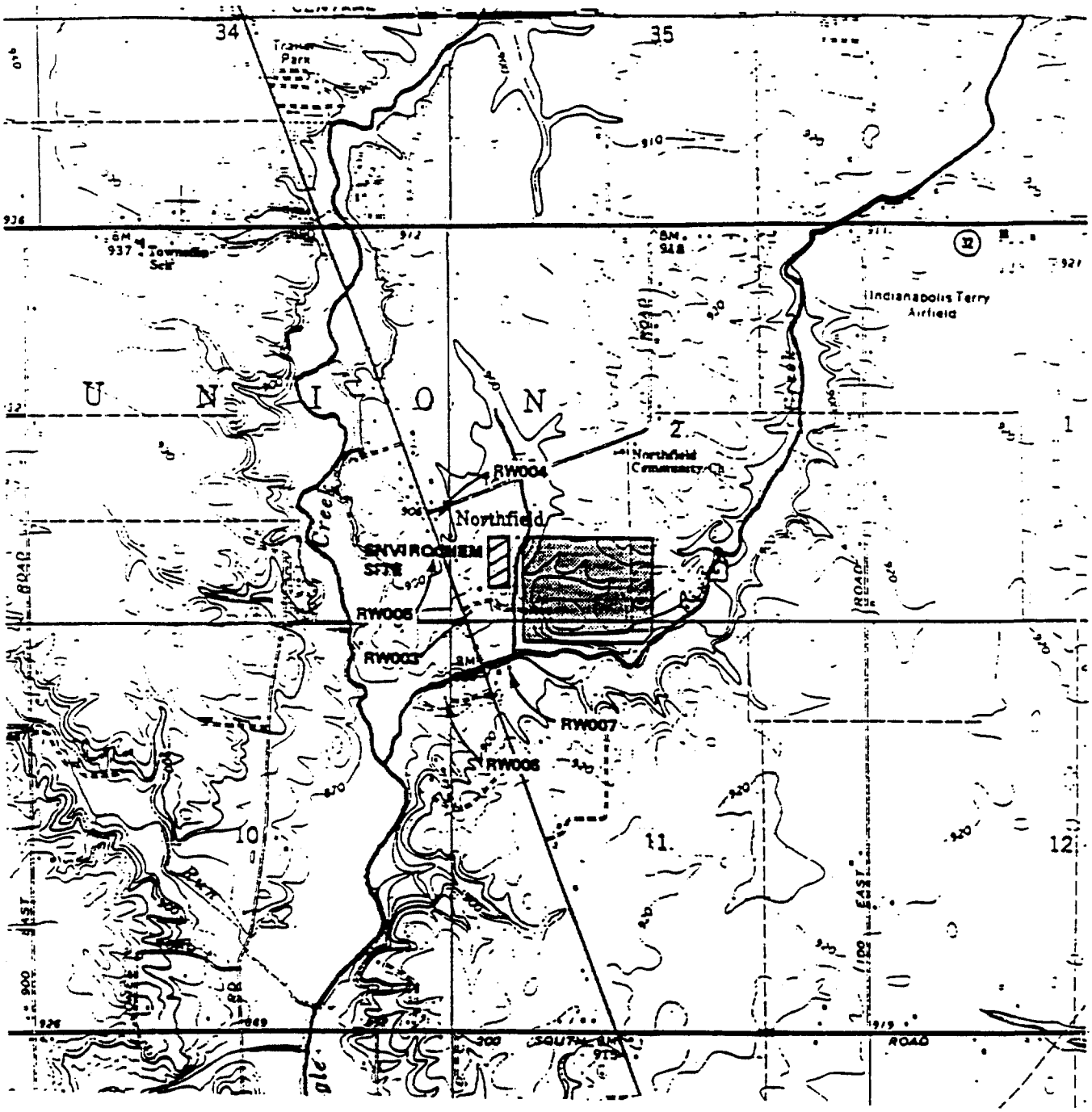


FIGURE 7
RESIDENTIAL WELL SAMPLING LOCATIONS
ECC SITE

APPENDIX B - Tables

On-Site Subsurface Soil (SS) and Soil Boring (SB) Sample Results, Phase I.

(Data used to develop Table 1.)

Chemical		Sample Depth (Feet)	Sample Location Number	Concentration Range - ppb
Organic Chemicals				
acetone	(SS)	0-1	AO-SE	30,300
aldrin	(SB)	0-1	AE - AG AN - B6	20,000
aroclor-1016 (PCB)	(SS)	N/A	N of P	10,800
aroclor-1232 (PCB)	(SS)	N/A	N of P	16,200
aroclor-1248 (PCB)	(SS)	N/A	N of P	10,800
benzoic acid	(SS)	0-1	AO-SE	11,000
	(SB)	0-1	AN - AE-AH	1,600-28,200
benzyl butyl phthalate	(SS)	0-1	AO-SE AM-SW	42,500-1,282,000
bis(2-ethylhexyl)phthalate	(SS)	0-1 (AI only)	AI - N of P	40-774,600
	(SB)	0-2	D7-B6	226,000-3,800,000
2 butanone	(SS)	0-1	AO-SE	5,200
	(SB)	0-2	D7-B6	89,600-99,200
chloroform	(SS)	0-1	AO-SE - AP-SE	580-890
	(SB)	0-1	AN-B6	20-41,800
chloromethane	(SS)	0-1	AA	70
cis-1,3-dichloropropene	(SB)	0-1	AE-AG	12,000
1 2-dichlorobenzene	(SS)	0-1 (AO-SE only)	AO-SE & N of P	31,500-534,100
	(SB)	0-1	AE-AH & AE-AG	84,100-252,700
1 4-dichlorobenzene	(SS)	0-1 (AO-SE only)	AO-SE & N of P	33,700-570,000
1 1-dichloroethane	(SS)	0-1	AP-SE	700
	(SB)	0-1	AN	60
1 2-dichloroethane	(SS)	0-1	AO-SE	280
4 4-DDD	(SB)	0-2	AE-AG & D7	1,080-5,900
4 4-DDE	(SB)	0-1	AE-AH & B6	100-160
4 4-DDT	(SB)	0-2	An - D7	40-36,000
dieldrin	(SB)	2	D7	700
diethyl phthalate	(SS)	N/A	N of PD	35,000
2 4-dimethylphenol	(SS)	0-1 (AM-SW only)	AM-SW N of PD	36,000-88,000
dimethyl phthalate	(SB)	0-1	AE-AG	25,400
di n-butyl phthalate	(SS)	0-2	AD-SE - N of PD	67,900-79,000
	(SB)	0-1	D7 & AE-AG	11,000-112,200
di n-octyl phthalate	(SS)	0-1	AC-AM-SW	10-127,800
	(SB)	0-1	AE-AH - B6	8,900-300,000
1 2-diphenylhydrazine	(SS)	0-1	AM-SW	68,600
	(SB)	0-1	B6	4,000

Chemical		Sample Depth (Feet)	Sample Location Number	Concentration Range - ppb
endrin	(SS)	0-1 (AP-SE only)	AP-SE - N of P	190-10,000
	(SB)	0-2	AE-AH & D7	670-11,200
endrin aldehyde	(SB)	2	D7	20,000
endosulfan I	(SS)	0-1 (AP-SE only)	AP-SE - N of P	40-8,300
endosulfan II	(SS)	N/A	N of PD	6,300
	(SB)	0-2	AE-AG & D7	110-11,100
endosulfan sulfate	(SS)	N/A	N of PD - N of P	3,300-4,000
	(SB)	2	D7	19,000
ethylbenzene	(SS)	0-1 (AO-SE only)	AO-SE - N of PD	600-514,000
	(SB)	0-1	AE-AN - AE-AG	9,000-5,649,000
gamma-BHC (lindane)	(SS)	N/A	N of PD	760
	(SB)	0-2	B6 - D7	170-540
heptachlor	(SB)	0-1	B6	170
hexachlorobutadiene	(SS)	0-1	AO-SE	5,000
isophorone	(SS)	0-1 (AL only)	AL - N of PD	40-44,000
	(SB)	0-1	AE-AH - B6	41,700-340,000
methylene chloride	(SS)	0-1	AE - AM-SW	10-515,000
	(SB)	0-2	AN - D7	10-94,000
2-methylnaphthalene	(SS)	0-1 (AM-SW only)	AM-SW - N of P	7,200-104,000
	(SB)	0-1	AE-AH - B6	8,800-130,000
4-methyl-2-pentanone	(SS)	0-1 (AO-SE only)	AO-SE - N of P	730-2,600
	(SB)	0-2	B6-D7	7,600-29,600
2-methylphenol	(SS)	N/A	N of P - N of PD	61,300-142,600
	(SB)	0-1	AE-AH - B6	20,800-130,000
4-methylphenol	(SS)	0-1 (AM-SW only)	AM-SW - N of PD	52,000-535,600
	(SB)	0-2	D7-B6	31,000-510,000
naphthalene	(SS)	0-1 (AO-SE only)	AO-SE - N of PD	1,500-55,700
	(SB)	0-1	AE-AH - B6	26,100-470,000
nitrobenzene	(SS)	0-1	AO-SE	7,800
n-nitrosodimethylamine	(SS)	0-1	AO-SE	9,900
n-nitrosodiphenylamine	(SS)	0-1	AI-AK	40-1,400
n-nitrosodiproplyamine	(SS)	0-1	AO-SE	12,000
phenanthrene	(SB)	0-2	AE-AH & D7	4,600-8,000
phenol	(SS)	0-1 (AO-SE only)	AO-SE - N of PD	7,200-447,000
	(SB)	0-1	AE-AH - AE-A6	24,500-138,000
styrene	(SB)	0-1	AE-AH & AE-AG	5,000-19,000
2,3,7,8-tetrachlorodibenzo-p-dioxin	(SB)	0-2	D7 - B6	6-8
tetrachloroethene	(SS)	0-1	AO-SE - AM-SW	570-4,116,000
	(SB)	0-2	AE-AH - D7	131,000-744,100
toluene	(SS)	0-1	AO-SE - AM-SW	14,800-751,000
	(SB)	0-2	AE-AH - D7	80,000-964,000
toxaphene	(SS)	N/A	N of P	10,800
trans-1,2-dichloroethene				
	(SS)	0-1	AP-SE - AO-SE	1,500-79,700
	(SB)	0-1	AN-B6 - AO-SE	100-41,800

Chemical		Sample Depth (Feet)	Sample Location Number	Concentration Range - ppb
1,2,4-trichlorobenzene	(SS)	N/A	N of PD - N of P	49,000-389,600
	(SB)	2	D7	119,000
1,1,1-trichloroethane	(SS)	0-1 (AO-SE only)	AO-SE - N of P	17,500-7,411,400
	(SB)	0-1	AN - B6	40-1,203,200
trichloroethene	(SS)	0-1 (AL only)	AL - N of P	2-6,080,200
	(SB)	0-1	AN - B6	60-2,135,700
vinyl chloride	( )	0-1	AO-SE	6,400
xylenes, total	(SS)	0-1	AD-SE - AM-SW	15,000-1,160,000
	(SB)	0-1	AE-AH - B6	97,000-882,600
			AM-SW	

On-Site Soil Boring Sample Results, Phase II.

(Data used to develop Table 1.)

Chemical	Intermediate (depth, 2-4 feet)		Deep (depth, 5-9 feet)	
	Sample Location	Concentration Range - ppb	Sample Location Number	Concentration Range - ppb
Organic Chemicals				
acetone	SB-04 & SB-06	16-17,000	SB-04 & SB-09	18-6,500
bis(2-ethylhexyl)phthalate	SB-01 & SB-08	230-730	SB-08	270
2-butanone	SB-04 & SB-02	6-17,000	SB-09	1,000
butyl benzyl phthalate	SB-09	400	-	-
chloroform	SB-01 & SB-02	57-2,900	SB-08	5
1,1-dichloroethane	SB-09	380	-	-
1,1-dichloroethene	SB-02	1,600	-	-
diethyl phthalate	SB-06 & SB-02	1,200-9,000	-	-
dimethyl phthalate	SB-06 & SB-02	360-1,200	-	-
di-n-butyl phthalate	SB-08	53-420	SB-04	310
ethylbenzene	SB-01 & SB-02	15-21,000	-	-
2-hexanone	SB-04 & SB-08	70-1,600	-	-
isophorone	SB-06	500	-	-
4-methyl-2-pentanone	SB-08 & SB-01	35-250	SB-09	44
methylene chloride	SB-04 & SB-02	8-10,000	SB-01 & SB-09	27-190
naphthalene	SB-02	640	-	-
phenol	SB-06 & SB-09	610-1,100	-	-
tetrachloro-ethene	SB-04 & SB-06	5-18,000	SB-08	8
toluene	SB-01 & SB-02	52-31,000	SB-02 & SB-09	10-120
trans-1,2-dichloroethene	SB-04 & SB-02	17-1,500	SB-09 & SB-08	29-41
1,1,1-trichloroethane	SB-04 & SB-02	3-49,000	SB-08 & SB-09	11-110
1,1,2-trichloroethane	SB-04	14	-	-
trichloroethene	SB-08 & SB-06	16-110,000	SB-08 & SB-09	3-76
xylenes, total	SB-04 & SB-02	36-110,000	SB-08	11
Inorganic Chemicals				
aluminum	SB-02 & SB-04	4,580,000-6,660,000	SB-05 & SB-09	3,390,000-6,840,000
arsenic	SB-05	4,600-10,000	SB-05 & SB-09	4,500-15,000
barium	SB-09 & SB-05	32,000-54,000	SB-05 & SB-01	27,000-81,000
beryllium	SB-06 & SB-09	360-380	SB-09	3,900
cadmium	SB-08	440	SB-01	4,100
calcium	SB-02 & SB-05	102,000,000-121,000,000	SB-09 & SB-05	68,800,000-140,000,000
chromium	SB-02 & SB-01	12,000-15,000	SB-05 & SB-09	9,600-17,000

Chemical	Intermediate (Depth: 2-4 feet)		Deep (Depth: 5-9 feet)	
	Sample Location	Concentration Range - ppb	Sample Location Number	Concentration Range - ppb
cobalt	SB-01 & SB-02	5,000-11,000	SB-08 & SB-01	6,500-8,500
copper	SB-02 & SB-08	18,000-26,000	SB-01 & SB-04	18,000-23,000
iron	SB-06 & SB-08	14,400,000-20,500,000	SB-05 & SB-09	13,200,000-20,700,000
lead	SB-05	5,600-26,000	SB-05 & SB-09	4,500-17,000
magnesium	SB-01 & SB-09	26,400,000-34,100,000	SB-09 & SB-08	21,300,000-30,200,000
manganese	SB-01 & SB-04	289,000-451,000	SB-05 & SB-01	285,000-555,000
nickel	SB-09 & SB-08	13,000-24,000	SB-05 & SB-01	13,000-20,000
potassium	SB-09 & SB-08	1,450,000-2,030,000	SB-05 & SB-04	1,240,000-1,630,000
silver	SB-08	3,300	-	-
sodium	SB-01	859,000-1,640,000	SB-01	673,000-1,430,000
tin	SB-05 & SB-04	17,000-30,000	-	-
vanadium	SB-02 & SB-08	16,000-25,000	SB-08 & SB-09	15,000-22,000
zinc	SB-02 & SB-04	47,000-69,000	SB-08 & SB-09	38,000-65,000

On-Site Groundwater Sample Results, Phase III.

(Data used to develop Table 2.)

Chemical	Concentration Range - ppb
Organic Chemicals	
acetone	52
1,1-dichloroethane	6
methylene chloride	64
trans-1,2-dichloroethane	13
trichloroethene	21
1,1,1-trichloroethene	7
Inorganic Chemicals	
manganese	24
potassium	1,195

Off-Site Surface Water and Sediment Sample Results, July 1983.

(Data used to develop Table 3.)

Chemical	Surface Water		Sediment	
	Sample Location Number	Concentration Range-ppb	Sample Location Number	Concentration Range-ppb
Organic Chemicals				
benzoic acid	-	-	SD-004b	<4,000
bis(2-ethylhexyl)phthalate	SW-004	12	SD-005	912
chloroethane	SW-004	120	-	-
1,1-dichloroethane	SW-004	45	-	-
fluorotrichloromethane	-	-	SD-002	<5
4-methylphenol	-	-	SD-004	960
methylene chloride	SW-004	<5	SD-004 - SD-005	3-9
o-xylene	SW-004	<5	-	-
tetrachloroethene	SW-004	<5	-	-
1,2-transdichloroethene	SW-004	330	-	-
1,1,1-trichloroethane	SW-004	120	-	-
trichloroethene	SW-004	67	-	-
vinyl chloride	SW-004	10	-	-
Inorganic Chemicals				
aluminum	SW-003 - SW-002	340-3,050	SD-001 - SD-002	2,172,000-9,744,000
antimony	-	-	SD-004 - SD-003	<1,000-<2,000
arsenic	-	-	SD-004 - SD-005	<500-1,100
barium	-	-	SD-006 - SD-002	27,000-102,000
beryllium	-	-		<1-1
boron	-	-	SD-001 - SD-002	23,000
cadmium	-	-	SD-002	230
cobalt	-	-	-	-
copper	-	-	SD-001 - SD-002	7,000-23,000
cyanide	SW-001 - SW-002	<1	SD-004 - SD-005	<10,000-73,000
iron	SW-001 - SW-002	280-4,460	SD-001 - SD-005	8,398,000-18,696,000
lead	-	-	SD-006 - SD-005	6,800-48,000
manganese	SW-003 - SW-002	76-580	SD-001 - SD-002	161,000-499,000
mercury	SW-003 - SW-004	<1	SD-004 - SD-003	<100-<250
nickel	SW-001	47	SD-001 - SD-005	<4,000-23,000
selenium	SW-003	6	SD-004 - SD-003	<100-<200
silver	-	-	SD-004 - SD-005	<500-1,100
thallium	-	-	SD-004 - SD-005	<500-<1,100
tin	-	-	SD-004 - SD-003	<1,000-<2,000

Chemical	Surface Water		Sediment	
	Sample Location Number	Concentration Range-ppb	Sample Location Number	Concentration Range-ppb
vanadium	-	-	SD-004 - SD-002	<10,000-23,000
zinc	-	-	SD-001 - SD-002	<29,000-75,000

Off-Site Residential Well Groundwater Sample Results, May 1983.

(Data used to develop Table 4.)

Chemical	Sample Location Number	Concentration Range - ppb
Inorganic Chemicals		
aluminum	RW005 - RW007	36-498
arsenic	RW005 - RW004	7-28
barium	RW007 - RW005	2-303
boron	RW005 - RW007	580-2,280
calcium	RW007 - RW005	171-103,000
chromium	RW005	4
cobalt	RW006 - RW007	9-10
copper	RW005	42
iron	RW004 - RW005	9-3,290
lead	RW005	6
magnesium	RW003 - RW005	220-40,900
manganese	RW006 - RW005	34-133
nickel	RW003 - RW006	7-19
silver	RW006	8
sodium	RW005 - RW003	15,300-381,000
zinc	RW006 - RW005	49-134

Off-Site Groundwater Sample Results, Phase I, II, & III.

(Data used to develop Table 5.)

Chemical	Phase I July 1982		Phase II November 1983		Phase III December 1984	
	Sample Number	Concentration Range - ppb	Sample Number	Concentration Range - ppb	Sample Number	Concentration Range - ppb
Organic Chemicals						
acetone	2C - 3A	<100-1,400	2C - 3A	<9-15,030	6A-001 - 10A-001	24-53
benzene	-	-	3A	<9	3A-001 - 7A-001	4
2-butanone	-	-	1A	<9	10A-001	26
chloroethane	3A-002 - 3A-001	116-120	3A	41	10A-001 - 7A-001	29-90
chloroform	-	-	3A	<9	6A-001	3
chloromethane	-	-	-	-	3A-001	100
chrysene	3A-002	< 1-20	-	-	-	-
1,1-dichloroethane	3A - 3A	86-96	3A	51	10A-001 - 3A-001	8-10
diethylphthalate	3A	< 1-20	-	-	-	-
ethylbenzene	-	-	-	-	3A-001 - 7A-001	3-4
fluoranthene	3A-002	< 1-20	-	-	-	-
isophorone	3A-001 - 3A-002	< 1-20	-	-	-	-
methylene chloride	3C-001 - 3A-001	<5-8	4C-01 - 6A-01	<9-20	9A-001 - 1A-D	2-22
o-xylene	2A-001	9	7A-01 - 3A-01	<9-12	-	-
pyrene	3A-002	< 1-20	-	-	-	-
styrene	2C-001	<1-<5	-	-	-	-
tetrachloroethene	-	-	2A-01 - 5A-01	<9-9	-	-
trans-1,2-dichloroethane	-	-	-	-	10A-001 - 11A-001	3-4,000
trans-1,2-dichloroethene	3A-002 - 3A-001	16-19	3A-01	<9	-	-
1,1,1-trichloroethane	3A-001	<1-<5	-	-	-	-
trichloroethene	3A-002 - 3A-001	7-9	1A-01 - 1A-02	<9	9A-001 - 11A-001	3-28,000
vinyl chloride	3A-002 - 3A-001	6-7	3A-01	86	-	-
Inorganic Chemicals						
aluminum	3A-002 - 5A-001	320-1,720	6A-01 - 7A-01	<200-61,500	2A-001 - 1A-001	65-304
antimony	5A-001	4	1A-01	<20	-	-
arsenic	3A-001 - 3A-002	19-20	1A-01	<10	3A-001	15
barium	2B-001 - 1C-001	150-660	2B-01 - 3A-01	188-1,070	2A-001 - 3A-001	287-868
beryllium	-	-	1A-01	<5	-	-
cadmium	-	-	1A-01	<1	-	-
calcium	-	-	-	-	3A-001 - 6A-001	70,240-161,100
chromium	5A-001 - 3A-001	11-13	7A-01	144	2A-001 - 3A-001	11-15
cobalt	-	-	6A-01 - 7A-01	<50-80	-	-
copper	-	-	6A-01 - 7A-01	<50-106	3A-001	16

Chemical	Phase I Duplicate Field		Phase II November 1993		Phase III December 1994	
	Sample Number	Concentration Range - ppb	Sample Number	Concentration Range - ppb	Sample Number	Concentration Range - ppb
iron	1C-001 - 3A-001	600-8,300	4C-01 - 7A-01	108-150,000	10A-001 - 2A-001	51-2,931
lead	-	-	6A-01 - 7A-01	<5-102	7A-001 - 1A-001	7
magnesium	-	-	-	-	7A-001 - 3A-001	29,780-131,800
manganese	2C-001 - 3A-001	17-260	4C-01 - 7A-01	23-1,930	2A-001 - 6A-001	49-94
mercury	2A-001 - 1A-001	<1	1A-01 - 2C-01	<1	-	-
nickel	3A-001 - 3A-002	42-77	6A-01 - 7A-01	<40-176	5A-001 - 3A-001	32-84
potassium	-	-	-	-	6A-001 - 3A-001	2,129-105,940
selenium	3A-001 - 3A-002	3-4	1A-01	<2	-	-
silver	-	-	3A-01 - 2C-01	<10-33	-	-
sodium	-	-	-	-	1A-001 - 3A-001	10,060-380,700
thallium	5A-001	<1	1A-01	<10	-	-
tin	-	-	1A-01	<20	-	-
vanadium	-	-	1A-01	<200	-	-
zinc	-	-	2A-01 - 7A-01	11-276	7A-001 - 2A-001	37-260

APPENDIX C - Public Comments & Responses

PUBLIC COMMENTS AND RESPONSES

1. COMMENT The report fails to mention in any respect the cleanup work done in an EPA supervised removal action in 1983 and 1984.

   RESPONSE This information can be found in the document under the Site Description and History section, page 2, last paragraph.

2. COMMENT The report suggests on page 38 that the elevated levels of sodium, and potentially other contaminants, could be migrating from the site to private residential wells. The report also suggests that the site is the cause of the elevated levels of sodium found in the residential wells.

   RESPONSE This information was reviewed and appropriate changes were made to the document. There is no evidence to indicate that the site is the source of the elevated levels of sodium in the groundwater. This has been stated in the document in the first paragraph of the Conclusions section.

3. COMMENT There are no residential wells between the site and Finley Creek.

   RESPONSE This information was reviewed. Please note that there is one private well between the site and Finley Creek (see Figure 3-6 of the ECC RI/FS report.)

4. COMMENT No geological assessment or description of the flow patterns of the aquifers under the site are mentioned in the report.

   RESPONSE Information on groundwater flow and geological assessment were added to the document under the Demographics, Land Use, and Natural Resource Use section.

5. COMMENT If sodium is not in the on-site well, how could the sodium in the private wells be coming from the site?

   RESPONSE It was not our intention to imply that the site was the source of the sodium. This disclaimer is in the document in the first paragraph under the Conclusions section.

6. COMMENT The analytical data in the report is approximately 10 years old. These numbers are not representative of current conditions and/or the potential risks to private well users.

RESPONSE The purpose of the public health assessment is to assess all past, present, and future exposure pathways. In order to do this, all data collected on the site is evaluated. As was mentioned in your comment, there has not been any recent additional analytical testing of this site. As the ISDH does not perform any environmental sampling, we are dependent on the sampling results from other agencies. Therefore, we can only evaluate data that is available and recommend that additional sampling is needed for a particular media.

7. COMMENT The ISDH did not include qualifiers in the data tables.

RESPONSE In the writing of the public health assessment, any data that is estimated or below their detection limit is not used in the report. Any qualification of the data is included in the section entitled Quality Assurance and Quality Control. In order to not just reproduce the actual reference document, we recommend that the reader refer back to the original document from which the data were retrieved. This qualifier has been added to the document.

8. COMMENT Sample depths appear to have been rounded to the nearest foot. This is not mentioned in the document.

RESPONSE This information was reviewed and appropriate changes were made to the document.

9. COMMENT The concentration range shown for aldrin in the data table found on page B-1 is incorrect; it should read 20 ppm. The sample location should read AE-AG.

RESPONSE This information was reviewed and appropriate changes were made to the document.

10. COMMENT The sample depth for 1,2-dichlorobenzene should be 0-1 not 8-1.

RESPONSE This information was reviewed and appropriate changes were made to the document.

11. COMMENT The report suggests that the site may have adversely affected the receiving stream, although all analytical data suggest otherwise.

RESPONSE Off-site surface water was determined to be a potential exposure pathway as Finley Creek and its associated tributary are principal surface drainage areas for the site. The report clearly states under the Pathway Analyses section (off-site surface water), "This medium is not considered a main source of contaminant exposure to humans."

12. COMMENT There are concerns that there is not evidence that there was no arsenic found in the mussels prior to the freshwater mussel study performed.

RESPONSE This comment is beyond the scope of this document. The information regarding the freshwater mussel study was taken from the Ecology and Environment 1986 Remedial Investigation and Feasibility Study.

13. COMMENT The hypothetical future risks, if any, need to be discounted by the site remedial work expected to be done later this year under the existing Consent Decree.

RESPONSE We are responsible for noting any potential risk to human health in the public health assessment. Even though the potential risk is proposed to be removed, we have to mention this risk none the less.

14. COMMENT The recommendations should not suggest that the private wells are affected by the site as there is no proof that the wells are hydrogeologically connected with the site.

RESPONSE This information was reviewed and appropriate changes were made to the document. Please see page 21 under Environmental Data Gaps.

15. COMMENT The recommendations should reflect the fact that recommendation 2, 7, 8, and 10 will be met by the Consent Decree.

RESPONSE This information was reviewed and appropriate changes were made to the document.